THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CX. No. 2457.] LONDON, JUNE 14, 1910. [62ND YEAR. PRICE 6d.

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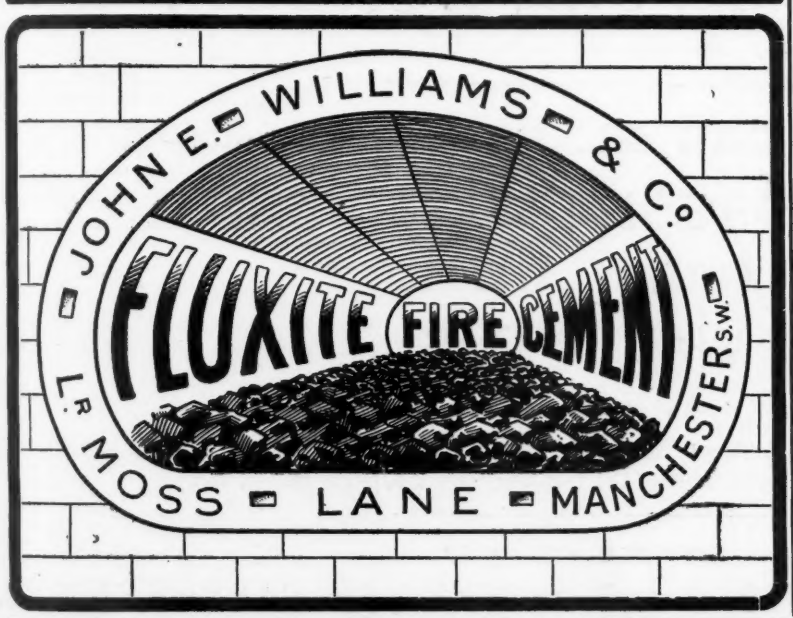

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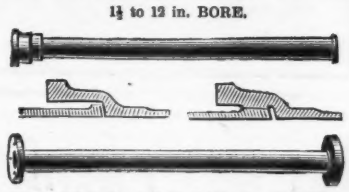

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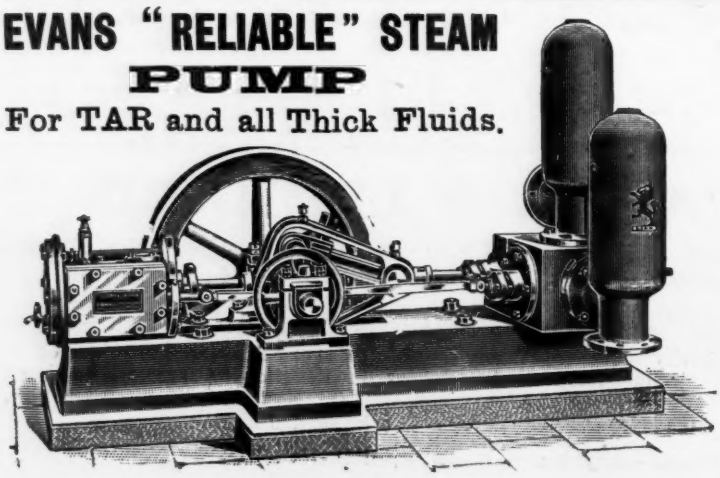

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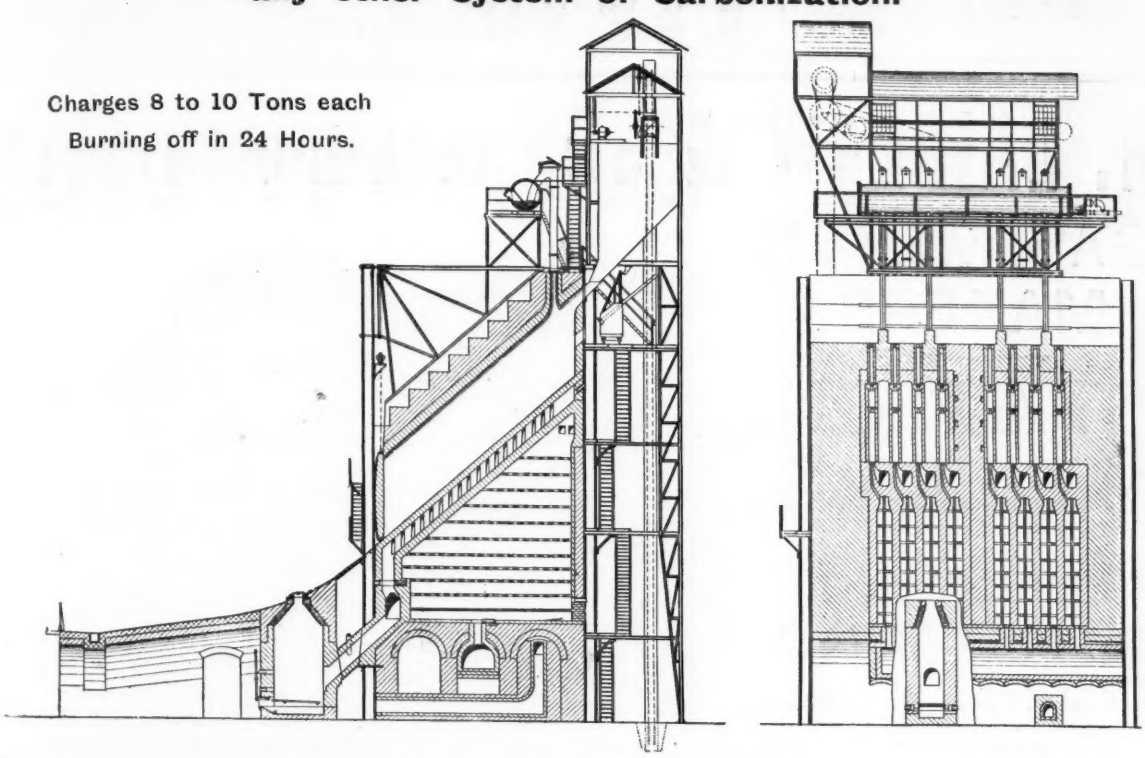

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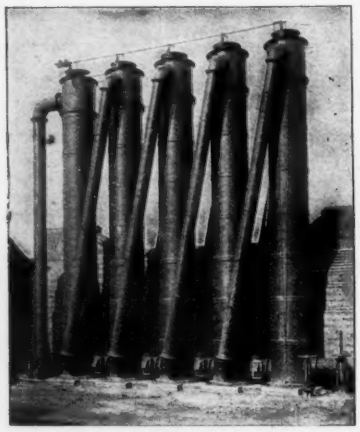

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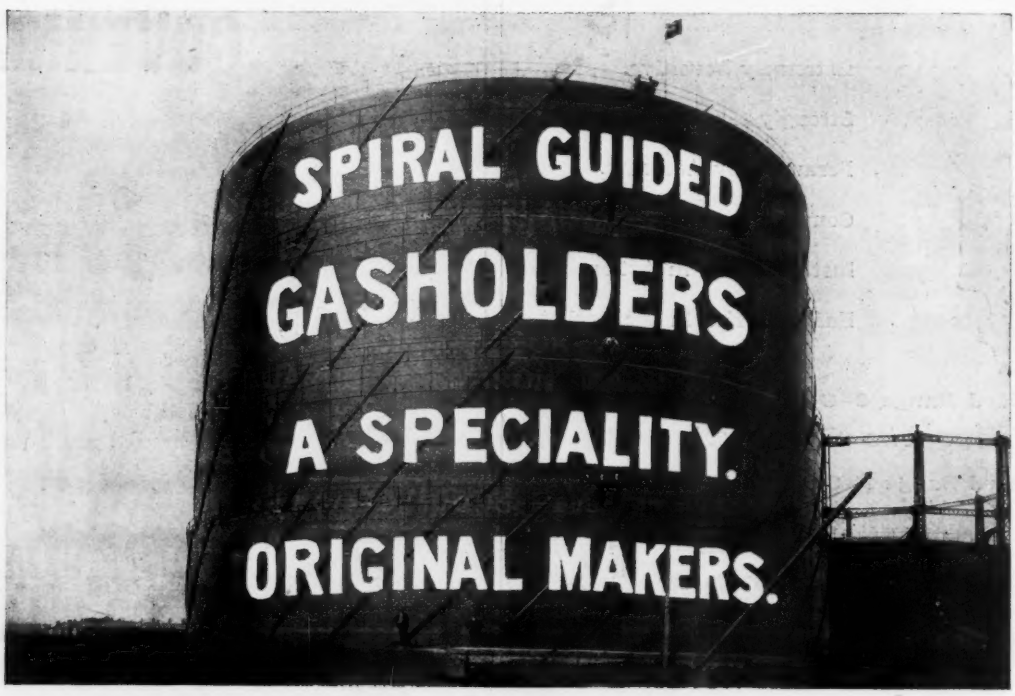

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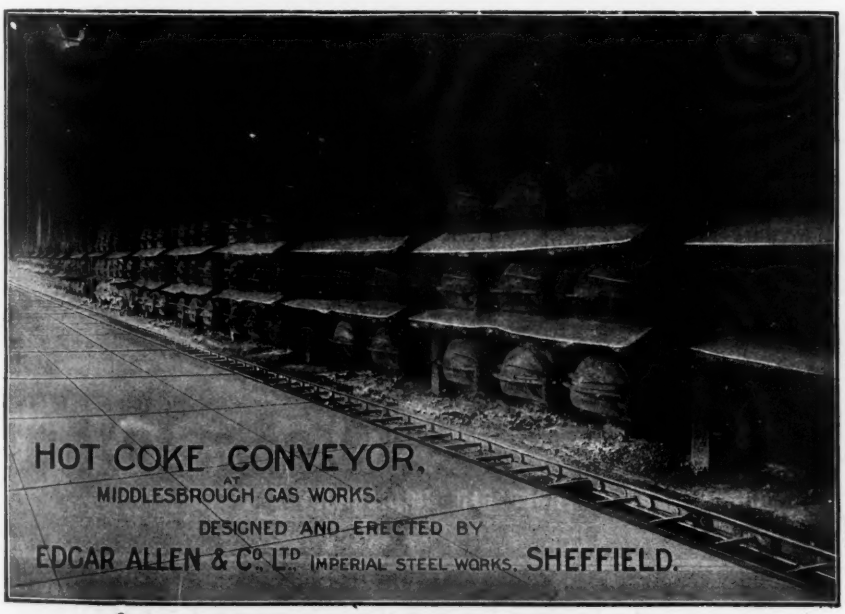
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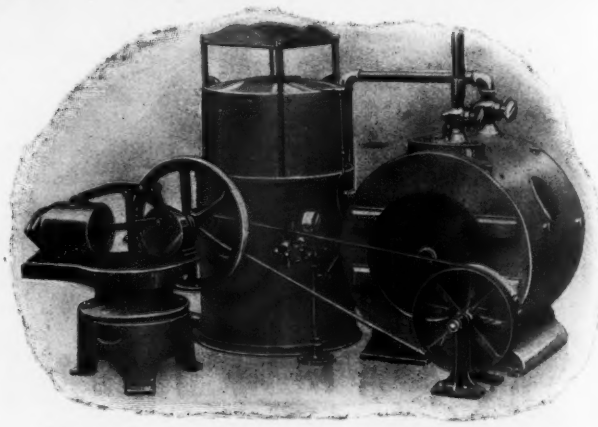

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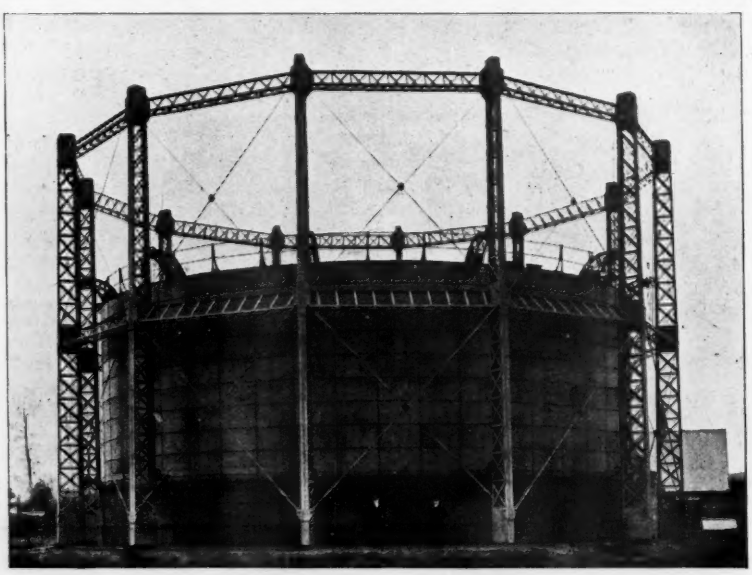

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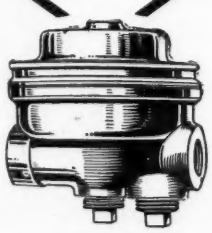

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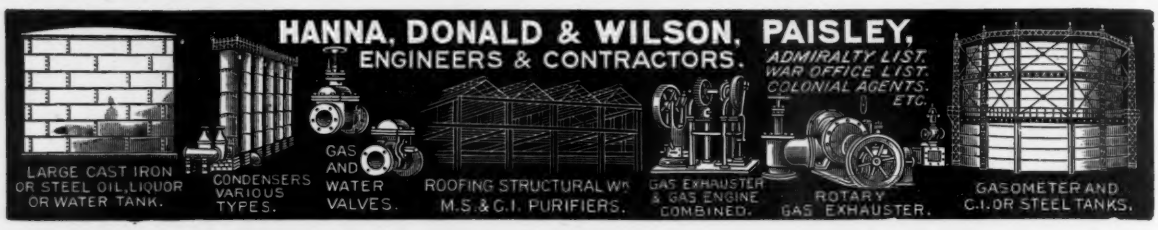
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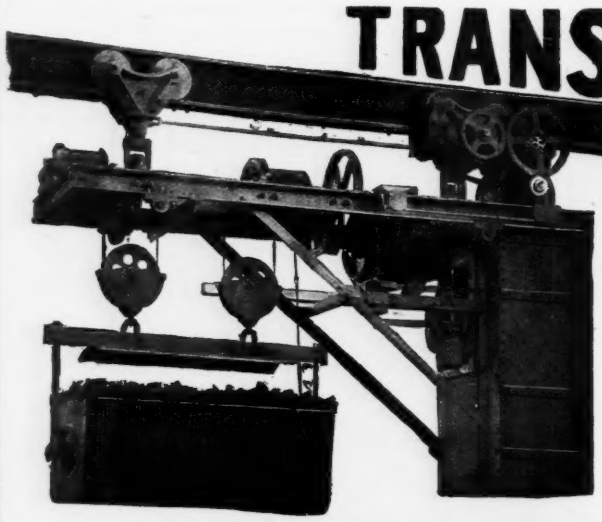

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INSTITUTION OF GAS ENGINEERS.

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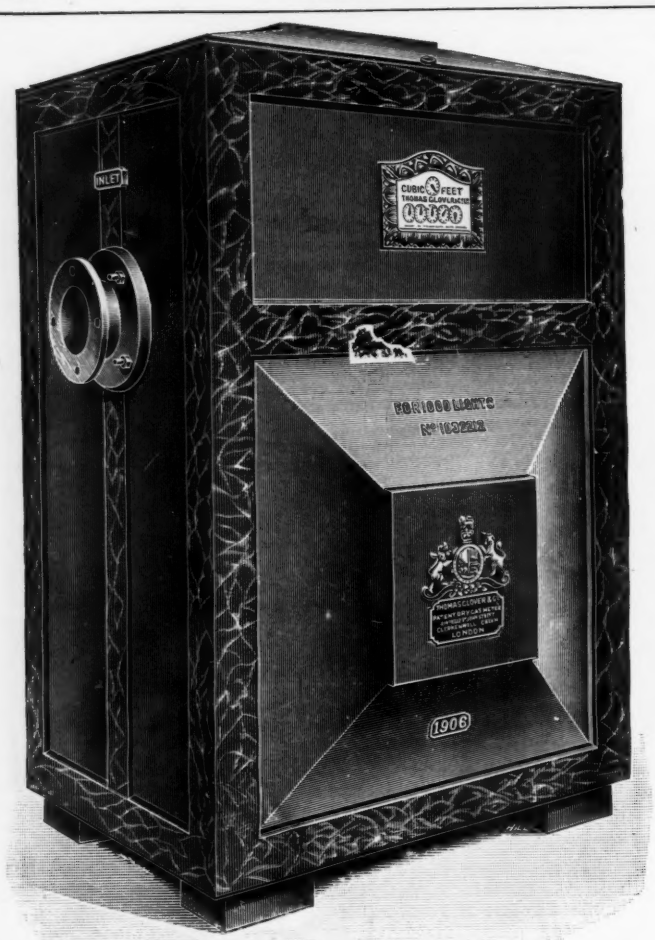

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EDITORIAL NOTES—GAS, &c.

The Attempt to Wreck the Standard Burner Bills.

THE would-be wreckers of the Standard Burner Bills have already commenced their malign operations. Notices were on the House of Commons paper for last Thursday in the name of Mr. R. D. Holt, that the Bills be read that day three months; and, in the event of the second reading being agreed to, he had a further proposition to submit, that it be an instruction to the Committee to omit the Liverpool Gas Company from the first schedule to No. 1 Bill. The same day Mr. George Roberts also gave notice that, on the order for second reading, he should move that the Bills be read that day three months. On the order for the second reading being introduced, several members objected, and the matter was postponed until to-day. The objection of several members shows that the opposition has been hard at work, organizing (as predicted last week) unreasonable hostility to the measures in the House itself, with the view to their overthrow rather than allow them to go before a Committee, and give the parties most intimately concerned an opportunity of obtaining judgment on the statement of their relative cases. It is interesting to note that Mr. Holt, in whose name the first motions stand, is a shipbroker of Liverpool, and is the member for the Hexham division of Northumberland. The appropriateness of his association with this matter is only traceable to his business relations with Liverpool, and not directly as a parliamentary representative; he having been twice rejected when a candidate for a seat in one of the divisions of the city. Mr. Roberts is a Labour member, and one of the representatives of Norwich, in which city he is prominent as a leader of the Socialist party.

The joint opposition to the Bills was initiated in, and engineered from, Liverpool; and the enormity of a number of companies combining to show cause for the granting of a common object has lately been sounded, from the same quarter, in many council chambers in the country, though the councils have no concern in the matter, other than the very remote one of fearing that such combined applications to Parliament will, in some mysterious way, be inimical to their interests. This very case illustrates the groundlessness of any such fear, inasmuch as the opponents have themselves shown a fine facility and capacity for combination, and the procedure before Committees gives them every opportunity not only for the presentation of their hostile case, but for the investigation of individual grievance. As to Mr. Holt's second notice of motion, instructing the Committee to omit the Liverpool Gas Company from the Bill, it would not alter the opposition in the House on the second reading one iota if the Company were to withdraw. The opposition would proceed just the same. It will be remembered that, before the House of Lords Committee, Liverpool was adopted as the pivot for the ineffective opposition case; but if, apart from the question of a uniform standard for testing quality, a large part of the strength of the case for the Standard Burner Bills lies in the changed circumstances of the gas industry and the modes of utilizing gas to-day, then the greater the reason why what the promoting Companies are asking for should be conferred upon the Liverpool Gas Company.

We hope that Gas Companies generally (whether or not participating in the promotion), with Members of Parliament as shareholders, have followed our advice of last week, and have communicated with the latter, showing reasons why they should support the second reading of the Bills, and not allow them to be defeated without a proper hearing, in view of the strong case existing for a common standard testing-burner, and in view of the endorsement of Parliament of the adoption of this particular burner during the past five sessions. Any officials of Gas Companies who desire any information in regard to the matter should, without delay, put themselves in communication with the Parliamentary Agents for the Bills (Messrs. R. W. Cooper and Sons, of 5, Victoria Street, S.W.). It may be well to mention, so that there may be no misapprehension, that though the order for second reading is entered for to-day, messages now to gas-shareholding Members of Parliament will not be too late, as the probability is that all that will be done at this sitting will be to fix an evening for the discussion and division. Let it be remembered that this antagonism to these Bills is a matter that concerns not only the promoting Companies, but the whole gas industry, and the future of the industry. It is therefore hoped that a strong case will be submitted, and that it will have a big numerical backing in the House in opposition to the motions for wrecking the measures. Nothing that can be done must now be left undone to ensure their victory over the machinations of the obstructionists to our industrial progress. The Parliamentary Agents are doing their part well in this connection; but the support that any Gas Company—however small it may seem to be—can render will all go to strengthen this fight for right.

There is all the more reason for stout resistance in the fact that the opposition, numerically, has been considerably weakened since the transfer of the measures from the House of Lords to the House of Commons; and this gives an inkling as to one of the reasons for the tremendous effort that is being made by the remnant of the opponents to destroy the Bills. When the Bills were in the House of Lords, the number of local authorities concerned who took up a passive attitude in regard to them was in excess of those who opposed; and we calculate there are a dozen less of the Companies opposed in the House of Commons. The numerical strength, too, of the opponents (this is especially noteworthy as an indication of changed feeling) has declined at least one-half; and—let this be particularly marked—three parts of the still active opponents are owners of electrical undertakings. This is significant. Indeed, it is not too much to say that this is not purely a fight in defence of local interests; it is a case of the municipal directors of local trading undertakings taking advantage of their administrative position to make war upon their competitors and upon private enterprise, and to endeavour to secure some unfair advantage from it. Therefore we ask every Gas Company, loyal to the common interests of the industry, with any influence—large or small—to take the hint, and use that influence in persuading to an active resistance against this effort to put a further spoke in the wheels of progress of the gas industry.

The Tale of the "Analysis."

FROM the compiler (Mr. George Orford, the Assistant-Accountant of the Gaslight and Coke Company) we have received a copy of that standard work "Field's Analysis "of the Accounts of the Principal Gas Undertakings of "England, Scotland, and Ireland." Turning to the title page, it comes almost as a shock to be reminded that this is the forty-first year of the publication of the indispensable "Analysis;" and the fact of the flight of time induces one to retrospection. The years covered by the publication of the "Analysis" have been progressive and prosperous on the whole; but interspersed here and there have been some critical periods. The statistical work itself, started by the late Mr. John Field, has greatly expanded; and the quantitative representation in money, materials, gas, and so forth, that is found in the volume last issued by Mr. Orford must, in respect of the comparable undertakings, have been altogether undreamed of when the originator issued, in the one introductory volume, his analytical work for the years 1869-70-71, relating only to the London Gas Companies. The work has since been extended to the Suburban and the principal Provincial undertakings.

Reaching down from the shelf upon which it has long

reposed the first issue of the "Analysis," it is seen that the accounts of thirteen Companies, and all London ones, were then dealt with; now, and for many years, there have only been three Gas Companies in London. In 1869, when this work was inaugurated, the London Companies sold only 9,885,857,000 cubic feet of gas; in 1909, the three Companies sold no less than 38,290,723,000 cubic feet. The figures for the first year do not disclose how much gas was made per ton of coal carbonized; but the quantity sold was only 8438 cubic feet per ton. Last year the gas made per ton was 11,404 cubic feet. These few figures are more eloquent than any words could be as to expansion and prosperity, within the technical confines of the industry and beyond where the industry has to trade and make way with active competitors at its heels. Every figure in the new issue of the "Analysis" has an interest; and one is tempted to dwell on at any rate the totals, for every total carries a tale. Quoting only three of them, we have told, with the finest brevity, the tale of the great extension of the industry's service to the community. The customers of the London Gas Companies last year numbered 1,029,468, of whom 383,919 were ordinary, and 645,549 prepayment consumers. These are remarkable figures.

Can a Wrong be Right?

From time to time, we have taken the Hastings Corporation to task regarding the administration of their electricity supply undertaking and their public lighting policy, in respect to both of which we have contended, and there has been confirmation by the strictures and the attitude of the Local Government Board, that the interests of the ratepayers have been made subservient to those of the electricity concern. It appears that the Coporation have at length—not in this one connection, but generally in regard to their administration—awakened to their own deficiencies, for a Special Committee has been appointed to inquire separately into the administration of the various municipal departments. These departments are administered by Committees composed of members of the Corporation; and to the Council collectively these Committees have to report and obtain ratification of their proceedings. Therefore, no more than the appointment of the Special Committee is required to prove to all onlookers that the Council have become conscious of their own deficiencies as administrators. We are glad of this, because there is hope that the investigation will have the excellent effect of stirring the Council first to a recognition of the simple fact that, if their management of other departments has been faulty, it is just possible it may be so in connection with the Electricity Department. If the Council can be brought to this frame of mind, they may the better see things from the point of view of their critics, whose accusations and arguments are supported by many thousands of pounds of deficiency on the electricity undertaking, by the heavy cost for public electric lighting, and by the annual robbing of the public purse for the purpose of converting further gas-lamps to electricity, without achieving the slightest good. Such persistent financial impropriety, such want of economy, and such waste of public funds, show to anyone of ordinary intelligence that there must be maladministration somewhere. Hastings does not stand alone in this matter of bad management; but even among municipal electricity undertakings, Hastings has obtained an unenviable notoriety.

The "Hastings Observer," which puts its back up to support the electricity policy of the Corporation, is applauding heartily all attempts at economy in other departments. It says, in effect, the policy that is right in connection with electricity is very wrong in connection with other departments. We cannot understand this attitude. Referring to a recent comment in these columns on Hastings electricity affairs, our contemporary cannot deny the facts stated; but, curiously, it finds the facts amusing reading. In the same issue is a comment on the report of the Special Committee on the Cemetery Department; and the document indicates that large economies can be effected in its working. Upon this our contemporary remarks: "It may be conceded that "the Town Council cannot be accused of actual wrong-"doing in the past in connection with this department, be-"cause its sanction to the excessive expenditure was given "in ignorance. But now that the light of knowledge has "been thrown on the matter, this is all altered; and the "Council has no more right to continue to waste the rate-"payers' money on what it knows is excessive expenditure "than any of its members has to enter a ratepayer's house "and purloin his goods." Apply this pregnant statement to the position in which the Electricity Department and the public lighting affairs are in to-day. It cannot be claimed that the Council are persisting in their present policy in ignorance. They have been warned time and again—not only in the public press, but by the Local Government Board, and by the financial results of their fatuous policy. They may therefore fairly be accused of persisting, in this respect, in a course of actual wrong-doing. To continue a policy in the Electricity Department that imposes burdens on the ratepayers is, to say the least, dishonourable; and to make conversions of public lamps by drawings from the public rates without going into the matter of efficiency, is a monstrous abuse of trust. There is the authority of the "Observer" for saying that "the Council has no more right "to continue to waste the ratepayers' money on what it "knows is excessive expenditure than any of its members "has to enter the ratepayer's house and purloin his goods." The whole article in our contemporary is an impeachment of the administration of the Council, included in which is an insinuation (which, it may be confessed, we do not understand, and have no special knowledge upon) as to the bribing of voters "by keeping them or their friends in positions in "which they are not wanted, but for which they are paid "by money extracted from the ratepayers." It would seem that what is wrong in one department of municipal administration is considered right in another. Also that, while it is desired to effect economies in all other departments, it is perfectly legitimate to allow extravagance in one. We cannot understand thoughts and arguments that are revolutionary merely to serve a purpose while circumstances have similarity. What has been said here in reference to Hastings will, as readers are all too well aware, fit other towns; but Hastings offers an apposite illustration.

Prospects of Gas-Engine Improvement.

Have we reached a standard in the design of town gas engines beyond which any remarkable changes are improbable? An article appeared in the "Daily Telegraph" recently, by the "Engineering Correspondent" of that paper, in which he expresses the opinion that we have; but there is a safe refuge perhaps in the term "remarkable." In our opinion—regarding the question generally, and not placing too much emphasis on the qualifying word—the knowledge available is as yet a little too unsettled and limited to speak with any degree of positiveness as to finality in progress on the present lines. No one was satisfied with the efficiency of the gas-engine (say) a decade ago. But extraordinary strides were made at the beginning of this century; so much so that the British Association Committee on Gaseous Explosions were able last year to report that the advances in indicated thermal efficiency had brought us to the point of 36·8 per cent. With gratifying and substantial achievements so close in our rear, we are not inclined to such confidence as to commit ourselves to any dogmatic assertion as to the end of efficiency having been reached. It is preferable to regard the matter from the point of view of the British Association Committee. The facts that the Committee have taken in hand (purely in the cause of progress) a colossal work with the view of sifting out and co-ordinating knowledge on the subject of the internal combustion engine, and that, after all the work that has been done, there is confession on the part of the greatest authorities that there has been failure to obtain complete knowledge of the fundamental essentials to further progress in the working efficiency of internal combustion engines, are sufficient for withholding judgment at the present time on the point upon which the "Engineering Correspondent" makes a somewhat categorical pronouncement.

It is quite true that Mr. Dugald Clerk has warned (this was only last year) against any expectation as to a considerable increase in indicated thermal efficiency under the existing circumstances, and has intimated that the possibility of increase will depend mainly upon considerable alterations in the actual cycle used—any substantial additional development being unlikely on the old lines of increasing compression. In saying this, Mr. Clerk does not indicate finality, nor any personal opinion as to the impossibility of effecting departures that will produce even greater efficiencies than those at present obtained as the reward of persistent work on the part of the manufacturers and investigating specialists. The "Engineering Correspondent"

of our contemporary takes a somewhat loose general guide upon which to form his judgment as to marked improvement by making comparison of the different machines by the different manufacturers; and he finds that it requires something more than a casual glance to distinguish one make from another. We do not think this is an instance in which the criterion is a sufficient or safe one. There has been too much irregular movement in regard to the investigation of the problems and phenomena surrounding the gas-engine; and the makers have shown philosophic attributes in practising that eclecticism which has produced for their machines the best efficiencies under present conditions, and which has made their engines so alike that one has to take something more than a casual glance to distinguish one make from another. We do not say that the "Engineering Correspondent" is wrong in his contention; but there is a preference on our part for postponing judgment until a better base than that which at present exists is before us upon which to found it. If we read him aright, he looks to bigger advances being made in producer and other power-gas engines, and in crude or residue oil engines. Why there should, in this particular matter of prospective improvement, be any discrimination between town-gas and producer-gas engines (taking the engines by themselves, and not including the auxiliary producing plant), we fail to see.

Unsolicited Testimony from Above.

Testimony as to the efficiency of modern gas lighting for street purposes has come from many council chambers and other mundane quarters; but till last week there had never been, to the best of our knowledge, a testimonial--unsolicited or otherwise—from above. An unsolicited one has come; and our electrical friends will please note that there was no special preparation for the occasion that gave rise to it. Rather more than a week ago, one of the British Army airships made a night journey of some 70 miles—from Farnborough, encircling St. Paul's Cathedral, and then home again. On board were Colonel J. E. Capper (Captain), Lieut. Waterlow (at the helm), and Mr. T. Ridge, the Assistant Superintendent of the Army Balloon Factory (Engineer). The "Daily News," yesterday week, published an account of an interview with Mr. Ridge, in the course of which he said: "The lights of London were a great guide; and, after Fleet Street, Whitehall struck one as being a particularly well-lighted thoroughfare. The Houses of Parliament were another easy landmark to pick out; and we could see the dial of Big Ben as we passed not very far from it." Fleet Street, Whitehall, and the vicinity of the Houses of Parliament illustrate high-pressure gas lighting by various systems.

Further Shrinkage in the City Arc Lighting.

Where high-pressure gas-mains are carried, work for them quickly follows. The high-pressure mains from Fleet Street have been continued from Ludgate Circus to Blackfriars Bridge; and, in a day or two now, New Bridge Street will be illuminated with 1500-candle power high-pressure lamps of the type of those now in Fleet Street. One refuge lamp will be of rather lower illuminating power. In the case of Fleet Street, the lamps are suspended from brackets attached to the walls of the buildings; but in New Bridge Street, workmen have been busy the last few days erecting substantial columns, carrying swan necks, from which the lamps will be suspended. New Bridge Street has been ill-lighted for many years by old pattern electric arc lamps; and those who use this busy thoroughfare will be pleased with the pending change. In this position, too, the gas-lamps will have a better opportunity than in Fleet Street of displaying their powers, as here, unlike Fleet Street, there are no newspaper offices and shops vying with each other in making the most dazzling outside illumination, and offending by so doing the eyes of pedestrians and those in charge of vehicles.

Nottingham and its Gas Engineer.

Reference was made in our last issue to a proposal by the Nottingham Gas Committee to increase the remuneration of their Engineer (Mr. J. H. Brown) by £200 a year, thus bringing his salary up to £1200; and it was pointed out how thoroughly well deserved this recognition was. As will be seen from the "Miscellaneous News" columns to-day, when the recommendation should have come before the Council, the Mayor (who is also Chairman of the Gas Committee) announced that it would be deferred until after the presentation of a report which a Special Committee of the Council are to prepare with reference to the questions of "one day's rest in seven" and "a minimum wage of sixpence per hour" for the Corporation employees. But it was made quite clear that the matter has only been deferred, and that the recommendation will be brought forward when the time fixed upon arrives. In fact, the Mayor told the Council plainly that if it was desired to have the gas undertaking managed efficiently they would have to act as other large concerns of a similar character did, and give fair remuneration. Here the matter of the material reward rests for the present; but Mr. Brown must meanwhile feel keen satisfaction, which we share with him, at the cordial acknowledgments of his services that were made by members of the Council when the report on the past year's results from the gas-works came up for consideration. In the first place, the Mayor said he thought it would be agreed that the undertaking was now being managed in the best and most economical manner possible; and Alderman Sir Edward Fraser followed with the remark that from 1902 down to the present time there had been a steady improvement in the returns. The gross profit, he pointed out, had risen from £75,000 to £110,000 over this series of years, which was most creditable to the Gas Engineer and those under his control. The improvement had not been sudden or spasmodic; and the returns showed very conclusively to his mind that "the agitation which was got up some years ago was not in the interests of the undertaking, but for extraneous purposes." Dr. Milner, too, while speaking in terms of praise of the "gas inquiry," was nevertheless constrained to admit that the improvement in the working had been gradual since Mr. Brown's appointment.

A Claim for Compensation.

Once more the House of Lords has been called upon to give a decision on a dispute arising out of the workmen's compensation enactments; and in this instance it was the provisions of the 1897 Act—the one, of course, under which most of the litigation has arisen—which had to be dealt with, inasmuch as the accident occurred some three months before the 1906 Act came into operation. The facts were simple. The complainant while at work met with a mishap which practically destroyed the sight of one eye; and he was awarded by the County Court Judge 15s. a week compensation. On appeal, however, it was decided that the claim was insufficient, because the amount claimed was not specified; and the Court of Appeal therefore found in favour of the respondents. This decision has now been reversed by a unanimous judgment of the House of Lords, who have come to the conclusion that there is nothing in the Act of Parliament, and nothing in the authorities, constraining them to arrive at a decision which, if arrived at, would deprive the appellant of the remedy to which otherwise he was undoubtedly entitled; and thus the workman is saved from what would, it seems, have been somewhat of a hardship. It was pointed out by the Lord Chancellor in his judgment that the Act says "the claim for compensation" must be made within six months of the accident; and he could not see why the Court of Appeal should hold that, unless the amount claimed had been specified, there had been no "claim for compensation." The argument for the respondents was that, unless a sum was named, the employer was deprived of an opportunity of settling the claim and so avoiding proceedings under the Act; but surely, said the Lord Chancellor, if he wanted to know he could ask the question, or he could make an offer himself. Lord Mersey also pointed out that the Act contained no words which required the workman to mention a sum of money. It was, he said, a strong thing to read into an Act of Parliament words which were not there; and it should not be done unless there was absolute necessity for it—which was not the case here. Though the action was under the 1897 Act, it may still be worth while to draw attention to it, as it appears that in previous cases under the same Act it had been decided—but not by the House of Lords—that a claim for compensation, to be good, must mention the sum claimed.

Suffocating Fumes from—Where?

London streets and railway stations were placarded on Friday by the halfpenny evening sensationals with a statement that members of seven families in Long Acre had been rendered

unconscious and nearly suffocated by gas. People jumped to the conclusion that it was coal gas; and for several hours the gas supply was under the odium of having been responsible for a discreditable piece of business. Representatives of the Distribution Department of the Gaslight and Coke Company responded with alacrity to a call to the scene; and they had not much trouble in fully satisfying themselves that the cause of the occurrence was not escaping gas, and that their system thereabouts was quite blameless. Representatives of the Charing Cross (West End and City) Electricity Supply Company were also promptly on the scene; but there is not a tittle of evidence available as to their assurance of the innocence of their system of participation in the affair. The fumes (according to one paper) were "suggestive of copper and rubber;" and the "fumes" could be seen as well as smelled and tasted, for they rose in a "thick volume, like smoke." This looks as though it would not be wrong to fix the responsibility on to electrical fusion and the burning of bitumen insulation. And not an inconsiderable length of electric cable has been relaid since the occurrence! Gas may turn aside, and allow the stigma to rest in another quarter.

The Resignation of Mr. Herring.

Writing on Saturday, our Scotch Correspondent said: The intelligence of the impending resignation of Mr. Herring from the position of Engineer to the Edinburgh and Leith Gas Commissioners, given in the "JOURNAL" last week, was not known to the public in Scotland till Wednesday afternoon, when an evening newspaper came out with the story. There were general expressions of surprise that Mr. Herring should relinquish a certain income and a comparatively easy life, to again enter the vortex of professional competition. Only those in a position to know were aware that when Mr. Herring was last granted an advance of salary, he undertook to give his services to the Commissioners for five years; and that the five years expire in November. There can be no one more conscious than Mr. Herring of the fact that, the special work of his Edinburgh stay being now virtually completed, there is positively no prospect of further advance in the way of remuneration. A longer stay in Edinburgh would have meant remaining a disappointed man, to the extent that betterment was impossible, and that all the time connections which would have been available had he been resident in London were passing into the hands of others. On various grounds, then, there is appropriateness in Mr. Herring returning South at this juncture. That he will be missed from the councils of the gas managers of Scotland, will be admitted by everyone. That he will be missed by municipalities and gas companies, is equally true; for he has been a tower of strength in engineering matters. There is reason to believe that, apart from his great work at Granton, his experience in Scotland will have been beneficial to Mr. Herring, in the sense that it has widened his knowledge of men and matters. The Granton Gas-Works will be his monument in Scotland. By their success will his reputation be judged. In their hey-day there is, and can only be, but one judgment—that the works have been a gigantic success. Among Press men, I can testify, Mr. Herring has been a great favourite, on account of his willingness at all times to meet them and to supply them with whatever information they desired, as well as on account of the form of his communications, which were so professionally perfect that they were capable of reproduction almost as received—requiring no labour in the matter of sub-editing. A special meeting of the Gas Commissioners has been called to consider Mr. Herring's resignation.

Personal.

Mr. W. M. DOWNIE has resigned the position of Gas Engineer and Manager of the Omagh District Council, who, as will be seen from our advertisement columns, are inviting applications for the appointment.

Mr. JAMES PATERSON, the Engineer and General Manager of the Redhill Gas Company, was on Friday last the recipient of a silver-mounted inkstand of handsome design, which was presented by the Secretary (Mr. Horace Long), on behalf of the officials and workmen at the gas-works, with many appreciative remarks and farewell wishes, on his leaving for Cheltenham.

We learn from a Dundee paper that Mr. A. Yuill, the Corporation Gas Engineer, has appointed Mr. J. MITCHELL, Assistant Gas Engineer at Ardrossan, as his Assistant, in succession to Mr. A. M. Fyffe, who, as already announced, has obtained the position of Engineer and Manager of the Nelson Corporation Gas-Works. Mr. Mitchell's father was at one time Manager of the Edinburgh Gas-Works.

The cosmopolitan character of the population of New York City is illustrated in a remarkable way in "Gas Logic" for the past month, on the opening pages of which are reproductions of advertisements in six out of the fourteen foreign languages in which the Consolidated Gas Company endeavour to show to the newspaper readers of various nationalities that New York's gas service is the best in the world.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 710.)

BUSINESS last week on the Stock Exchange was on a restricted scale and devoid of animation. The tone wavered irregularly from time to time; but some leading markets showed strong spots. It was account week, but the settlement was not remarkably heavy nor threatening to develop difficulties. The opening was dull and heavy under the influence of the tone at the close on the previous Saturday, and nothing made any headway. Gilt-edged were all poorer, although Consols closed firm. Railways declined, the Foreign Market was uneasy, Americans were shaky, and the fancy speculations did not attract much. There was more strength, but not more activity, on Tuesday. Consols gained ½; and Americans recovered sharply and then fell down again. Business was still at low pressure on Wednesday; but the tone in the leading departments was fairly good. Consols rose ¼, and Railways hardened. On Thursday, Consols gained another ⅛, Railways were firm, and Americans less distressed. The settlement was completed on Friday. Consols were scarcely so firm. But other gilt-edged issues were strong, and Rails were steady. The speculatives were in better demand, and Americans had a pause. Saturday was duller. Consols fell ⅛. Rails were irregular, and Americans gave way again. Rubber and Oil were popular. In the Money Market, there was a good demand, but no tightness. Discount rates were lower. On Thursday, the Bank of England rate was further lowered to 3 per cent. Business in the Gas Market showed a considerable falling off in point of volume; the week's transactions representing a paucity unequalled for some time past. Changes were few and very slight; and, but for some shrinkage in one or two Provincial issues, they tended upward. The activity in Primitivas was again a feature. In Gaslight and Coke, the ordinary was very moderately dealt in at prices ranging from 103½ to 104½. The secured issues were quite quiet; the figures for the maximum being 89⅜ and 89¾, for the preference 105 to 105¾, and for the debenture 82½. A few dealings were marked in South Metropolitan, ranging from 121 to 122; and the debenture changed hands once at 81½. In Commercials, there were transactions in the 4 per cent. at 107 and 107¾ (a rise of 1), and in the 3½ per cent. at 103½ and 104½. Among the Suburban and Provincial group, British was marked at 44⅛ and 44¼, South Suburban at 122, Tottenham "B" at 114¼, ditto debenture at 100, and Wandsworth "B" at 140 and 140½. On the Local Exchanges, Liverpool "A" was done at 220 (a fall of 3), and Newcastle at 103—a fall of 2. In the Continental companies, Imperial had only two bargains; the figures being 178½ and 179. Union marked 96 and 97 *ex div.*, and ditto preference 138½ and 139 *cum div.*, and 135 and 135⅛ *ex div.* Among the undertakings of the remoter world, Bombay realized 6⅜, Monte Video 12⅝ and 12¾, Primitiva from 7¼ to 7 7/16, ditto preference from 5¼ to 5 7/16, ditto debenture 98, and San Paulo 15⅝.

ELECTRICITY SUPPLY MEMORANDA.

Jandus Evasion and Refusal—Candle Power Readings—Electricity Failures and Newspaper Production—New Literature for Householders.

WE are grievously disappointed in Mr. A. Denman Jones, the Manager of the Jandus Arc Lamp Company, Limited. From an interview and letters published in the electrical press, we had been led to regard him as a courageous individual, who would be prepared to back his generalizations (when asked) by solid facts. We sought of him, in the "Memoranda" for May 24, solid facts; and he answers by a little vapour—not courteously and boldly in our columns, but in the columns of the "Electrician." It will be remembered that he told electricians through our contemporaries that the regenerative arc lamps in which he is interested have secured "several victories over the latest forms of gas." We naturally expected that the "latest forms" referred to the new high-pressure gas-lamps, giving, at a pressure of (say) 54 inches, 60 candles per cubic foot of gas consumed, with gas of about the ordinary southern qualities. But in his letter he does not quote a single instance of a victory by the Jandus lamp over the "latest forms" of high-pressure gas-lamp. He merely refers to the changes of ordinary street gas-lamps to electric lighting in municipal-electricity-controlled Hampstead, Harrogate, and Yarmouth. This is weak indeed. He says nothing about Westminster, Bethnal Green, or Hackney. It seems now that Mr. Jones is only anticipating "victories" over the "latest forms" of high-pressure gas lighting, as he now "regrets that it is not our practice to publish beforehand where the regenerative lamps will be installed." Why not, if the victories have been won? But we are promised opportunities soon of seeing localities lit by the regenerative arcs that have displaced high-pressure gas. It is to be hoped, for the sake of Mr. Jones's veracity, that the displaced high-pressure gas-lamps will prove to be of the "latest forms," as between the old high-pressure gas-lamps and the new the difference in efficiency is such as not to be despised even by electricians in the commercial competition of the times. Mr. Jones also stated that he would be pleased to supply electrical engineers with tabulated information as to the relative costs of gas and electric lighting, taken from authoritative sources. Being taken

from authoritative sources, it was thought that Mr. Jones would have no hesitation in supplying the figures to us. But, alas! his courage breaks down again here; and though we thought that it might be possible to tickle him into compliance by unctuous terms, there has been failure. The "Electrician" speaks of Mr. Jones's letter as "a reply to our criticism." What a strange misuse of the term "reply"!

Mr. Jones quotes, presumably to show the unreliability of our attributed efficiency of 60-candle power per cubic foot of gas consumed per hour of the newest form of Keith lamps, Mr. Herring's figures "of the Scottish National Exhibition" (we know what Mr. Jones means, but there is a looseness about the statement), which, he asserts, are usually quoted by gas people. They are not, and for a very simple reason which Mr. Jones fails to appreciate. He states that Mr. Herring's highest reading gives an efficiency of 73·6-candle power per cubic foot; the measurement being taken at an angle of 20° below the horizontal. The gas that was being used at Edinburgh in testing the lamp had an illuminating power about 25 per cent. greater than the gas in London; and the calorific power of the gas is also higher. The illuminating efficiency of an incandescent gas-burner does not increase *pari passu* with the illuminating power of the gas *per se*. Then he states that Professor J. T. Morris has found an efficiency of only 48 mean hemispherical candle power at the makers' works, which fell to 31·6 and 27·5 candles when tested on East London gas. These tests were made two years ago (June, 1908), when the lamp was new; and before there had been the experience that has produced improvements in the lamp. The experiments of Professor Morris giving the lower results were made prior to his tests at the works of the makers; and here he obtained a maximum candle power per cubic foot per hour of 52·5 candles. But he was only consuming 23·8 cubic feet of gas per hour, against the rated consumption of 25 cubic feet. The 1250 candles would have been more than 1300 candles at the 25 cubic feet consumption rate. Professor Morris does not satisfactorily explain the causes of the considerable difference in the maximum candle powers obtained in the two districts. He seems to attribute it not to the lamp, but to the difference (which he does not quote) in the calorific power of the gas in the two districts. The difference (according to the official returns) in calorific power is not a sufficient explanation—even in the case of the lamp as made in 1908.

In the discussion on photometry at the meeting of the Illuminating Engineering Society last March, Professor Morris had some good words to say for the Keith high-pressure inverted gas-lamp. He said that "his experience with these lamps was that the intensity of the beam was considerably steadier than that of the electric arc lamp, so far as rapid changes were concerned. . . . Regarding flame carbon lamps, they were not capable of giving such constancy of results, as could be seen by the way the observations were peppered about on the diagram." On the same occasion, Professor Sumpner said "it was a difficult matter to get the actual mean spherical candle power in the case of an arc lamp." Therefore what an amount of unreliability there must be in the published information (as the "Electrician" was recently pointing out) regarding the illuminating values of electric lamps of the different types! Then Mr. Jones says Mr. Bradley in his report "to the City of Westminster," gives figures varying from 38·4 to 23·6; the candle power being taken at 20° to 50° below the horizontal. Now is this fair of Mr. Jones to quote these figures in conjunction with those for the Keith high-pressure inverted lamp? The last report that we received from Mr. Bradley does not contain a single test of this form of lamp; and we know, at the time the report in our possession was issued, Mr. Bradley had not tested the lamps in Fleet Street. We should like to point out that, if our statement is correct [it is open to verification by Mr. Jones], the 38·4 refers to an upright burner with the gas supplied at (say) 8 to 10 inches pressure, and not at upwards of 50. With this 38·4-candle power before him for an upright burner and a comparatively few inches pressure, what becomes of Professor Morris's figures for an inverted burner and a pressure five times higher? Perhaps Mr. Jones will endeavour to escape from the *impasse* he has created for himself, by pointing out that Professor Morris's figures cited by him represent the mean hemispherical power, while the others represent something else. But that will not be a sufficient explanation in this instance. As a parting shot on this question, Mr. Jones asks, "Do the 60 candles usually run down to 30 in actual practice?" What a silly question for the Manager of a regenerative arc lamp company who claim several victories over the "latest form" of high-pressure gas-lamp. If those are not chimerical victories, the answer should, of course, be in the affirmative. But if he has been boasting without sufficient cause, then we should advise him to wait, and see the terrible way in which the 5s. fines per lamp per night will total up in Westminster. Those fines will be booked for something much less than the 50 per cent. drop in illuminating power referred to in Mr. Jones's question. Meanwhile a few trial lamps, of different candle powers in Aldwych, may interest our friend.

The electrical world do not look complacently on the heavy fines to be imposed in the case of Westminster for deficiencies in the illuminating power of the street-lamps. It is feared the plan of fines will not stop at Westminster; but that there will be many local authorities following suit. The electrical people have visions of a terrible account being set against them in respect of their wholesale extinctions when the supply of current collapses. Lamps in large areas are suddenly extinguished; and only 100 lamps at 5s. a time would represent £25. Mr. Bradley has had something to say about what he has learnt regarding the illuminating power of electric arc lamps through his peripatetic testing. Talking of electrical failures, there is sympathy with the plaint of the Editor of the "Worthing Gazette" over the disappointment, loss, and worry he has sustained through putting his trust in electric driving for his printing machinery. He is to-day a sadder and a wiser man than when he gave place to the electric motor. And while the "Electrical Review" has been advocating in special articles the adoption of electricity in printing-works, the Editor of the "Worthing Gazette," after suffering four failures of electrical energy, when his paper has been on the machine, says "if we were asked for our advice in such a matter, we could not conscientiously advise anyone to adopt electricity as a motive power—indeed, our advice to all so situated would be to have recourse to gas." The Editor has found that the eccentricities of electricity supplied from a central station mean to him as a customer loss of time, money, and prestige; and he ventilates his feelings in a full column of his paper. He is not the only one who has repeatedly suffered in Worthing. At such places of public resort as the theatre and the Winter Gardens, inconvenience and loss have been occasioned by these failures; and there have been bitter things said as the result. But there is no solatium to be obtained from the Corporation for wounded feelings, pecuniary loss, and inconvenience. The Corporation, knowing the vagaries of electricity supply from a central station, have a clause in their contracts absolving them from all responsibility for damage, loss, inconvenience, or moral and intellectual damages, arising from any interruption or discontinuance of the supply. If they had not, there is the Loughborough case behind which they can obtain cover. That was a case in which works had to be closed, and the operatives thrown out of employment through the failure of electrical energy. But there was no redress. Such failures are especially annoying in ordinary newspaper offices, where late production may seriously affect circulation, bring the advertisers humming round the harassed proprietors' heads, and cause people to wonder what the proprietors are about in dropping into such erratic ways. While, too, the electricity suppliers are free from anxiety on the score of damage, the printer may not get off scot free for any time-infraction of his contract. It's a one-sided world.

Dropping the editorial "we" for the nonce, the writer has received, at the place where he endeavours to take an interest in affairs apart from gas and electricity, a little circular with four folds from the local electricity suppliers. The circular is one of the products of the Electricity Publicity Committee, to which reference was made in the "Memoranda" on the 31st ult. On the front of the circular is the lady ironing a garment on a pretty and highly polished table without the protection of an ironing cloth, and with her head in dangerous proximity to a pair of electric incandescent lamps. Above the picture are the words (which do not coincide with our notions of the truth) "Electricity for *all* domestic purposes." On the first inside page, the writer is requested to send a postcard, on receipt of which a representative will call, and advise how to obtain the best light at the lowest cost. That is a rash promise, as the representative has no alternative but to advise the use of inverted gas-burners. On the next page, the reader is told that electricity can be used for warming the rooms by electric radiators, and that "a genial warmth is immediately obtained by merely turning a switch." There is an omission in not stating the number of radiators required for obtaining an immediate genial warmth. On the next page is the statement that electric cooking apparatus is obtainable in every variety at a reasonable cost. All householders are not so opulent that they will regard the prices as "reasonable." Then on the succeeding page the intimation is given that electric lighting requires some auxiliary aid to keep the house in a sanitary condition. The reader is informed that: "Wherever electric light is installed, the air in the rooms can be kept fresh and pure by means of electric ventilating fans"—in fact, they are "indispensable for keeping the house healthy." Is the appearance in the circular of this truth as to the indispensability of ventilating-fans in electric lighted houses an accident? It surely must be.

At St. John's Church, Roundhay, Leeds, last Wednesday, the wedding was celebrated of Miss J. E. Ethel Pickering, only daughter of Mr. J. R. Pickering, of "Crestmead," Roundhay, and Mr. D. Alborn Clapham, eldest son of Mr. and Mrs. W. S. Clapham, of "Rookcliffe," Keighley. The father of the bride is one of the Directors of Messrs. Clayton, Son, and Co., Limited, of Hunslet; the bridegroom's father being a member of the Board of Messrs. Clapham Bros., Limited, of Keighley. Following the wedding, a reception was held at the Mansion, Roundhay Park; and later Mr. and Mrs. Clapham left for North Wales.

It may be remembered that at the recent meeting of the Association of Water Engineers in York, the members received a cordial welcome from the Right Honourable the Lord Mayor (Alderman James Birch, J.P.). They will doubtless be pleased to learn that, having recently had conferred on him the freedom and livery of the Plumbers Company, he was last Tuesday formally admitted also as a freeman of the City of London. Sir Joseph Dimsdale, the Chamberlain, in enrolling him, said it was without parallel that a Lord Mayor of York should have been invested as a citizen of London during his year of office. The Lord Mayor of York, in acknowledging the compliment, said York was proud thus to be further linked with the City of London and its historic guilds.

THE INSTITUTION OF GAS ENGINEERS.

ANNUAL MEETING, JUNE 14 to 16, 1910.

PRESIDENTIAL ADDRESS

OF

MR. JAMES W. HELPS, M.Inst.C.E., of Croydon.

The first place in our thoughts to-day, in opening our annual meeting, is naturally given to the shadow which still lies heavy on our hearts, through the national, and may I say personal, loss occasioned by the death of our late beloved King. Surely no more spontaneous tribute has ever been paid to the memory of any monarch than the universal acceptance of the title of "Peacemaker" as the most fitting description of one who, to the full extent of his powers, worked earnestly and ceaselessly in the cause of peace and goodwill between man and man, and between nation and nation. Nor has this tribute been confined to words alone; for of him, indeed, it may be truly said "His works do follow him." Who can deny the existence, at the present moment, of an almost universal tendency towards the possibilities of agreement alike in the fields of industry and in the wider paths of political strife and national relationship? Surely in no more fitting way can the memory of the great dead be perpetuated.

As gas engineers, too, our thoughts this morning are with the family of one who bore an honoured name in our profession, and whose face will be seen no more among us. The death of Alfred Colson has robbed our industry of one whose presence could ill be spared, and has added another name to the memorial tablet of those stalwarts of the profession who one by one have lately passed away. Of conspicuous ability, unostentatious and retiring in disposition, he exercised a great personal and professional influence in all directions, and was ever-ready to extend a helpful hand to any colleague in need of friendly advice or assistance. The work which Mr. Colson did in furthering the interests of our industry, and in solving problems of interest to his professional brethren, are too well known to need description, while the important share he took in the working of our organizations, of one of which—namely, the old Institution of Gas Engineers—he was President in 1894, is doubtless fresh in the memories of all. Need I say that the sincere sympathy of all present, and of everyone connected with our industry throughout the civilized world, is extended to the bereaved relatives of him whom we mourn.

I have for some time past been wondering how, with the memories of so many excellent presidential addresses constantly before me, I could hope to bring before the Institution anything worthy of the high position in which you have placed me. Wherever I turned, I found that matters dealing with the engineering side of our profession were being discussed, not only in the frequent addresses of Presidents in all parts of the country, but in papers read before technical societies, and in articles contributed to the Technical Press. These matters, too, were treated in such a complete and thorough manner that to say anything new about them seemed to me to present an almost hopeless task—more especially as it had not been my lot of late years to have been engaged on experimental work in those directions which have more particularly engaged the attention of our profession.

Take, for instance, carbonization—a subject which during the past few years has been approached from every possible standpoint, and which, in the language of our esteemed Past-President, is yet in the "melting pot." To attempt to deal usefully with this branch of our business could only result in a mere recapitulation of what has so far been done, with a possible summing up, in my own words, of the comparative merits of the many methods which have lately been introduced, and more or less put into practical use. Such a course could not have added anything useful to the store of information available to any one who will take the trouble to study all that has already been dealt with in the Technical Press by those far better qualified to discuss the subject than is the author of this address. The same can be said with regard to many other matters closely connected with the technical side of our profession.

Having so far realized and appreciated my position, I decided that, although by your courtesy I am the elected President of an engineering society, I would take the bold step of, with but one exception, practically ignoring engineering subjects and of confining myself to the consideration of certain points connected with our industry, upon the true appreciation of which depends, in my opinion, the extent to which there are to be engineering matters to interest our profession in the future.

Changed Conditions.

Everybody must, I think, realize that the conditions under which the gas industry of to-day exists differ vastly from those which surrounded it even fifteen or twenty years ago, and that the question as to how we shall dispose of a thousand cubic feet of gas at a reasonable profit is now even more important than the consideration of the most economical way in which that quantity of gas can be produced. It is a truism that, unless a gas company can find a profitable market for the commodities it produces, it will avail it little to study improved methods of manufacture and production. That the difficulty of finding a profitable market presents an ever-increasing problem, it is useless to deny, more especially when the lighting market is considered.

Let me for one moment compare the conditions which existed in my own Company (say) in 1889 with those of the past year.

	1889.		1909.
Number of ordinary consumers	6,270	..	17,923
,, prepayment consumers	21	..	17,721
Total	6,291	..	35,644
Average consumption	59·107	..	34·891
Cost of distribution, after deducting rents	0·77d.	..	3·18d.

These figures are very striking, and would not be only striking, but somewhat alarming, if another side of the picture were not available.

	1889.		1909.
Gas-cookers on hire	557	..	18,884
Percentage of cookers to meters	8·8	..	53·0
Gas-fires on hire	200	..	5437

The figures relating to gas-fires are a little misleading, as they take no account of the very large number of fires in use which have been purchased outright or on the hire-purchase system.

The increase in the number of gas-engines, hot-water circulators, gas-coppers, &c., which have been supplied of late years is also very satisfactory.

The fact that our average comsumption per consumer has not decreased to a greater extent than the figures I have quoted show, is due to the enormous efforts that have been made in pushing our business by the establishment of showrooms, the appointment of canvassers and cookery demonstrators, and the introduction of specially qualified fitters for dealing with our maintenance systems and the wants of our customers generally.

Companies recognize that their greatest, if not their only, chance of profitable existence is to teach the consumer to adopt such methods of using the gas supplied to him as will enable him to obtain required results as economically as possible, and at the same time to prove to him that there is no other agency by which he is able to obtain such results as efficiently and as cheaply. It is certain, nevertheless, that these methods cannot be successful unless the old-fashioned ideas of *laisser-aller* "go by the board," and a drastic change made in the whole organization of our concerns, especially in the distributing department.

What are the two consequences of the change referred to? First, a great increase in the expense of dealing with our customers; and, secondly, a rapid rise in the number of men employed in the outside department, with a consequent increase in its relative importance.

The following table—giving the increase which has taken place in the number of men employed in producing the gas

and in dealing with it after it leaves the works—is sufficient proof of the changes which have been brought about in connection with the Company which I have the honour of serving.

—	1889.	1909.	Increase. Per Cent.
Average weekly number of men in manufacturing department . .	112	189	68·75
Average weekly number of men in distribution department . . .	33	241	630 30
Gas sold	Cub. Ft. 386,541,000	Cub. Ft. 1,257,204,000	225·24

It is also a significant fact that, whereas the average weekly number of men employed in both departments in the winter months of 1899 was 180, as against 121 in the summer, an increase of 49 per cent., yet in 1909, 431 men were employed in the winter, compared with the slightly larger number of 434 in the summer.

Relations with Local Tradesmen.

It is no good disguising the fact that gas companies have now, more than ever, become shopkeepers, and that work which was in the old days principally confined to ironmongers has, to a very large extent, drifted into the showrooms and workshops of gas companies. Is it wonderful that ironmongers should, as a rule, even now have failed to appreciate the significance of the change which has taken place, when it must be acknowledged gas companies themselves have but lately learnt the lesson? Gas-fitting is only one, and often not a very large, part of an ironmonger's business; and though it is true that some have appreciated the changed conditions to the extent of seeing that at any rate a certain number of their employees are trained in the proper handling of modern devices, still I think they have themselves really come to the conclusion that, without entirely altering their methods, they cannot hope to keep abreast of the constant changes which are being made in gas apparatus and in improvements of lighting and other devices.

I feel, however, that the terms upon which gas companies undertake work for consumers and supply them with apparatus and materials might well, with no loss to themselves, be such as will allow any ironmonger or local tradesman who is wise enough to qualify his staff for this particular class of business, to compete with a reasonable chance of profit. I am afraid, however, that an exception from this principle must be made with regard to the maintenance of incandescent burners, and that gas companies must, in order to secure satisfaction to their consumers, do this work on terms in themselves unremunerative even to the extent of giving labour free, and charging only at a reasonable profit for all material used.

I will not labour this point, but will content myself by saying that, while I appreciate the importance of reducing the selling price of gas as much as possible, I think the anxiety to do this can be carried too far. I feel sure it would be easy to prove that in some cases a penny taken off the price would really have been better employed, in the interests of both the consumer and the company, if it had been applied to giving the customer better attention to his wants and requirements.

Importance of the Distribution Department.

Assuming that gas companies have realized the importance of the work that falls upon the distribution department, are they taking such steps as will ensure that those entrusted with the work of the department are properly qualified for administering it? It is true, no doubt, that in gas-works up to a certain size the engineer or manager has sole charge of, and actually attends to the details of, the outside department, and that even in larger works such work is carried out (as it should be) under his personal supervision. I think, however, that the importance of making, as far as practicable, a separate department of distribution, and of placing at its head a man qualified not only by his technical knowledge, but by his general education and manners, to deal with consumers and possible consumers, must soon be recognized. And what is necessary with the head of the department is necessary, though possibly in a lesser degree, in the inspectors, fitters, maintenance men, and others working under his direction.

Training of Fitters, Etc.

I have spoken before now, and others have done the same, on the importance of technical and scientific training; but I fear that as a rule all of us have had in our minds chiefly the training of those who are employed, or are looking forward to being employed, in the higher branches of the strictly engineering department. What is becoming every day more and more evident, however, is that if gas companies are to continue their successful career, very special and very decided steps must be taken towards scientifically and practically educating, to the extent necessary, all those engaged in dealing with the distribution and use of gas. Distributing engineers are the product of the last fifteen or twenty years; they did not really exist before, because there was no actual necessity for them. The necessity has now arisen; and they are gradually, but surely, forthcoming. At the present day the importance of their position is assured, and it is to them that gas companies look for discovering, in consultation with their chiefs, the best means of dealing with their gas, as economically and as efficiently as possible, so that its uses may increase, and its consumption grow to such an extent as to keep engineers and managers busily engaged in devising improved methods of manufacture and purification, and of handling residual products.

I am afraid that, so far, many companies have been content with that description of training for fitters, maintenance men, &c., which consists in securing the services of certain reliable and competent men, who, in course of time, impart to their assistants such knowledge and skill as enable them, as business increases, to qualify for more important positions, and, in turn, to take their part in the education of their own assistants and mates. Now while I have nothing to say against such a system (which is perhaps a most natural one), I do suggest that it is the duty of every company in these days to provide a training ground in which beginners can obtain direct instruction in their special business, and in the principles which underlie it, and to see to it that this training ground shall not consist alone of the houses and premises of our consumers. I am of opinion that, although so much attention has been paid to the wants of the consumer of late years, yet much of its good effect has been nullified through the practice of occasionally sending improperly qualified attendants to deal with such wants. It has been, I am glad to say, the custom of some companies to offer facilities to their employees to attend suitable classes at the Technical Institutes in their towns, and to make arrangements for the holding of such classes. But even this is not sufficient unless it is so correlated to their daily work as to make it part of a carefully arranged and properly supervised scheme.

Qualification of Good Fitters, &c.

In order to become a satisfactory fitter, much more is required than the knowledge of how to properly pipe a house, and to fix the brackets, burners, stoves, &c. The fitter must know something of the theories which govern the successful and economical heating of water for household purposes, and must recognize the fact that a deviation from proper and correct methods—be it to ever so slight an extent—makes all the difference between economy and waste, and consequently between use or disuse on the part of the customer. He must be familiar with the principles of combustion, and be able to apply his knowledge to the discovery of faults and failings in the behaviour of atmospheric burners for lighting, heating, and cooking, to remedy them when they occur, and, better still, to so arrange and fix such burners and stoves that faults and failings shall not be forthcoming. But a knowledge of these and other principles is not alone sufficient. The fitter must have opportunities given him for examining and studying the construction and working of every kind of stove and every description of burner and other piece of apparatus which his superior officers deem worthy of recommendation for use among the public, before he is called upon to deal with such apparatus in his district.

Training Schools.

I lately had an opportunity of visiting the shops of instruction which have of recent years been opened by the Gaslight and Coke Company, and which have been so well described in the May number of "System and Modern Business." Into these, boys of a certain age are taken and given specified instruction in the use of tools and in the practical side of the gas-fitting trade, while at the same time they attend special classes in approved technical subjects held at a neighbouring Technical Institute. I recognize that such a complete system is possible only in the case of very large gas companies; but much can be done in the same direction by holding classes of instruction on the companies' premises, and by giving demonstrations as to the construction and use

of the latest forms of apparatus coupled with periodical lectures by practical experts on such subjects as water heating and circulation, atmospheric burners, &c.

A good incandescent burner, or a good fire, in satisfactory condition, will form the best possible advertisement for gas; a bad burner, or a bad fire, or even good ones not in working order, are directly the opposite. To secure the former condition, and to avoid the latter, it is absolutely necessary that those entrusted with the carrying out of our maintenance systems should not be allowed to gain their experience at the expense of the consumers, but should receive proper instruction in the most approved methods before being actually employed in attending to their wants.

In this connection, I should like to draw attention to the praiseworthy work which the members of the Manchester District Institution are doing in the direction of improving the education and practical training of the plumbers and fitters in the towns they represent, and to acknowledge the spirit of loyalty to the parent body in which they are approaching the matter.

I have always felt that the affiliation of District Associations to the main body (now happily accomplished) would enlarge the scope of usefulness of such Associations, and materially assist the work of our Institution. That such a belief is well founded is proved by the increased activity of the various Associations in many directions, and in none more distinctly than in the particular work now under the consideration of the above Association.

Quality of Gas Required by Consumers.

It will be remembered that, at the outset of my remarks, I stated my intention to leave engineering matters severely alone. I made the reservation, however, that it was to be with one exception; and this exception deals with a matter so closely allied to the interests of the consumer that I do not think it is in any way inconsistent with the task I set myself.

Before we can reasonably hand over the work of supply to our distribution staff, we must have taken every care that the article with which we ask them to deal must be in every way suited to the requirements of the consumer. The two principal conditions which it appears to me have to be observed are: First, that the gas should be of such a quality as will enable the consumer to obtain the very best results at the lowest possible rate, and that both its quality and composition, and the pressure at which it is supplied, should be kept as constant as practicable; second, that it shall be of a character such that it can be used without causing that deposition of solid hydrocarbon which in former years produced, and occasionally at the present time produces, so much inconvenience to the users, and trouble and expense to the suppliers, under the name of "short supplies" and stopped service-pipes.

Now with regard to the first condition, I do not think that there is any one connected with our industry who will deny that the gas which is required at the present day is one which possesses a reasonable and constant calorific power, quite independent of what its illuminating power may be; and the duty of every engineer, therefore, is to adopt such methods in the process of manufacture at his works as will enable him to place at the disposal of consumers a gas which is calculated to give the very best results under the changed conditions of modern-day requirements, and which can be supplied to the users at the very lowest possible price. There is no doubt whatever that Parliament has recognized this position, and has, I think, appreciated the fact that companies fully recognize that it is to their own interests to avoid taking advantage, for their sole benefit, of the relief that has of late years been afforded them in the matter of illuminating power standards, and that it would be a suicidal policy on their part to attempt to supply an article which would prove unsatisfactory to the customers, or would force them to use such an increased quantity of it as would give them an opportunity of making unfavourable comparisons with the cost of obtaining like results by other means.

Illuminating Power *v.* Calorific Power.

When I speak of the relief granted of late years in the matter of illuminating power, I allude, of course, not only to the granting of reduced statutory standards, but also to the legalizing of the No. 2 burner, which, while removing an injustice under which gas companies have suffered for many years, allows them to describe their gas as possessing an illuminating quality which it is in the power of every consumer to obtain from it. I am aware that, in the present state of affairs, I may be treading on somewhat dangerous ground; but the whole question seems to me so simple, and the justice of the case for the power to use the improved burner so apparent, that I do not hesitate to deal with it.

In common with most of my professional brethren, I look forward to the time when Parliament will recognize the fact that for all the purposes to which gas is at present applied, its illuminating power is a factor of the most trivial importance, and will, in consequence, eventually decide to abolish the illuminating power standard in favour of one indicative of its heating value. The retention of both the illuminating and the calorific tests would be, in my opinion, not only useless but likely to result in imposing such conditions on the industry as would prove a serious bar to the introduction of improved methods in the carbonization of coal, and in the after-treatment of the gas. It is, I believe, a recognized fact that the calorific value of gas as produced under the most modern methods does not always vary in direct proportion to its illuminating power, and in many cases which have come under my notice I have found—especially with vertical retorts and with horizontal retorts with what is known as full charges—that it is possible to decrease the illuminating power while actually increasing its calorific value. I have no hesitation, therefore, in expressing the opinion that the dual standard would have the effect of making it more difficult for gas companies to produce that quality of gas best suited for the use of the public and of adding appreciably to the cost at which it could be supplied.

It has sometimes been urged that the introduction of the No. 2 burner would result in the supply of a gas which would force the consumer to use a much larger quantity in order to get results similar to those he had previously obtained. Well, all I can say is that figures which have been supplied to me by companies who have been using the No. 2 burner for some time, prove that such an allegation is not borne out in practice; and in spite of the large increase in the use of gas cooking and heating stoves, the average consumption per consumer has shown no increase, but rather the reverse, as compared with the periods when the No. 1 argand was in use.

At the time of writing, the result of the Joint Bill before Parliament having for its object the granting of the use of the No. 2 burner in the case of some 47 companies is not known; but I can hardly imagine that the Legislature will refuse to grant in this case what has been given in so many previous instances, and what after all is simply restoring a state of affairs which Parliament recognized as just more than thirty years ago.

Prevention of Naphthalene Deposits.

I must now ask you to bear with me while I deal with the second condition to which I have alluded—viz., that the gas supplied should be of such a character as will not cause trouble through stopped service pipes. It may appear to some that I am dealing with ancient history, or that I am flogging a dead horse; but this opinion can only be held by those (and I know there are many) who have successfully adopted means whereby this difficulty has been overcome. That there are still some who have as yet failed to bring this about is proved by the number of inquiries that I receive on the subject from time to time. To such, my experience may not be uninteresting. I have so far been almost afraid to mention by name the solid deposition which is responsible for the trouble I refer to. Only a few years ago, it was almost impossible for a meeting of a District or other Gas Association to conclude without some part of the discussion being devoted to the question of naphthalene deposits, and the fact that this is not now the case is, of course, a clear proof that the trouble experienced from this bugbear is not so acute as formerly, and this notwithstanding that of late years—at any rate, until the introduction of heavy charges of coal—the conditions of carbonization have been more favourable for its production.

The Condenser Plant at Croydon.

I do not claim that there is anything novel in the system that has been adopted at Croydon. It is simply the result of carefully noting the accounts of what has been done elsewhere and of taking advantage of the information gathered from the investigation of the subject carried out, under the guidance of Dr. Colman, some time ago by the Southern District Association. I may at once say that when designing the new section of our works, I recognized that in one

part of our district the naphthalene difficulty had already been overcome. This district was supplied from a main the gas in which had been treated by the "Hastings" or "Botley" process, which had proved so successful that, while we were getting somewhat numerous complaints in other parts of the town, we were absolutely free in the district referred to. I was, however, face to face with the knowledge that the position at which the Botley apparatus was placed—viz., on the outlet of the governors—did not allow of its exerting any influence on the gas prior to that point, and that therefore the trouble experienced in the mains and apparatus on the works was not affected. My object, therefore, in arranging the plant of our new section was to introduce some system which would come into successful action as soon as the gas left the retort-house.

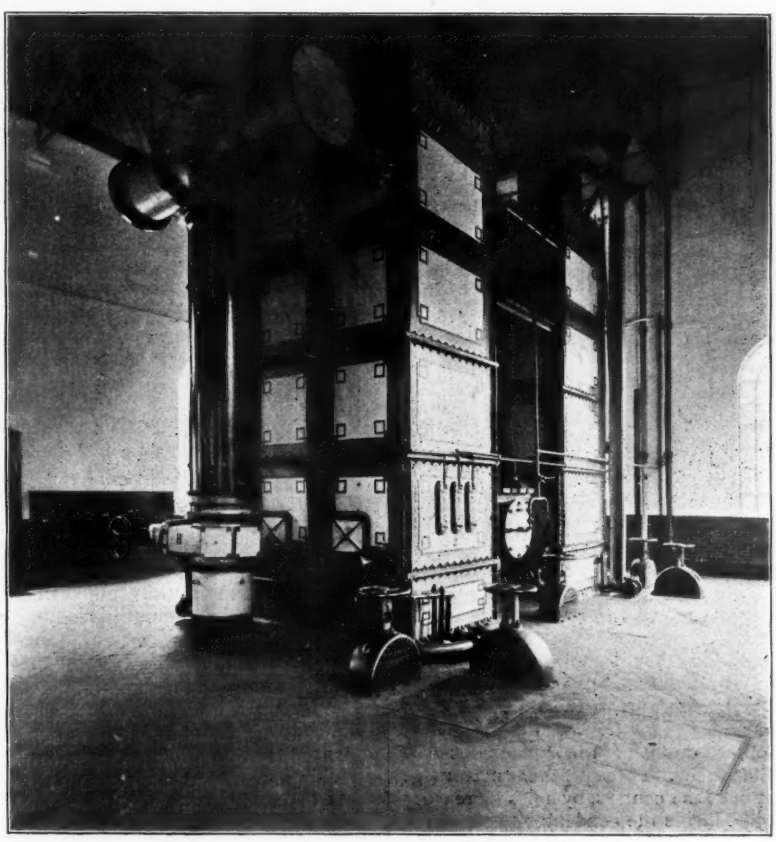
After leaving the retort-house at a temperature of about 140°, the gas passes through either one of two "Cyclones," or is split up into two streams, half passing through each "Cyclone." Here 90 to 95 per cent. of the tar remaining is thrown down. It then passes forward into a Livesey washer, the bottom part of which is filled up with brickwork to within about 10 inches of the bottom of the troughs. At this point the gas is still at a temperature varying between 105° and 125°, according to the quantity passing and the atmospheric conditions. Into this washer carburetted water-gas tar is run in a regular stream throughout the twenty-four hours; the quantity varying according to the gas made. This tar is heated to a temperature of about 90° to 100° Fahr. by a steam coil running on the top of the brickwork. By this means a considerable quantity of the naphthalene is absorbed, and, what is more important, nearly the whole of the light oils in the tar used are released. The amount so released, and therefore carried forward by the gas, may be judged from a reference to the following tables of tests by Dr. Colman:—

TABLE I.

Light Oil Vapours in the Purified Gas.	Old Section. C.c. per 100 C. Ft.	New Section. C.c. per 100 C. Ft.
Liquids boiling at 100°–130° C.	3·4	8·7
" " " 130°–170° C.	3·2	7·3

TABLE II.

Naphthalene in Gas at Scrubber Outlet.	Grains per 100 C. Ft.	
Maximum	22·6	8·9
Minimum	15·7	2·9
Average	19·8	6·3



The Reversible Gas Condensers at Croydon.

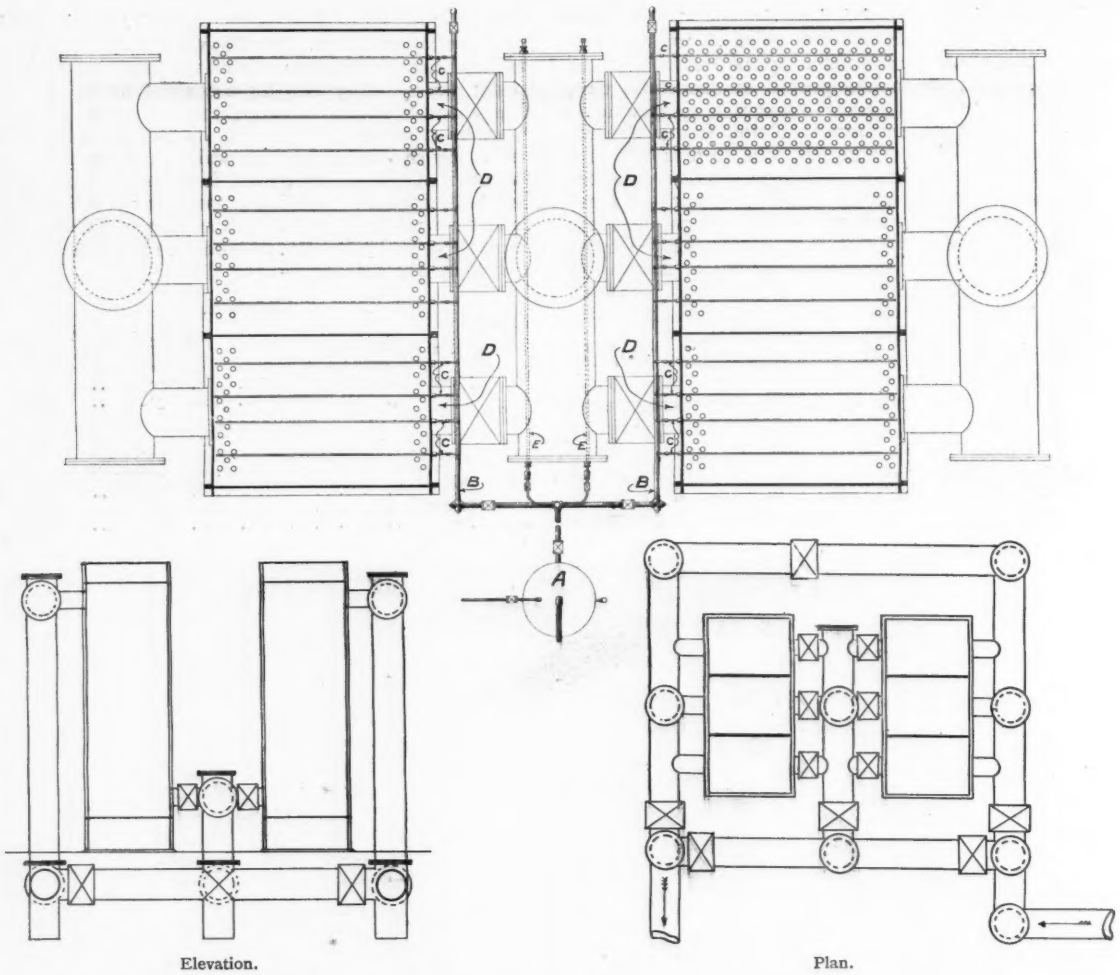
TABLE III.—*Composition of Tar Going into and Coming out of Hot Washer.*

	In.	Out.
Specific Gravity at 60° Fahr.	1·028	1·097
	Per Cent. by Weight.	
Light oils, up to 170° C.	13·3	1·9
Middle oils, 170°–270°	27·9	24·9
Heavy oils, 270°–350°	20·7	24·3
Pitch, above 350°	37·6	48·5

Table I. gives a comparison of the amounts of the vapours contained in the purified gas made in the new section and those contained in the old section on the same gas simultaneously treated, but where it passes direct from the foul main to the condenser. Table II. gives the amount of naphthalene present in the gas at the scrubber outlets at both sections. Table III. gives the composition of the water-gas tar before entering and after leaving the Livesey washer.

After leaving the Livesey washer, the gas is drawn through the water-tube condensers made to our own special design by Messrs. Clapham Bros. The peculiarity of these condensers consists in the fact that the two units, each capable of dealing with 2,000,000 cubic feet per 24 hours, are divided vertically into three entirely separate compartments, each having its own gas and water inlets; so that when the condensers are being worked at, or near, their full capacity the gas and water are split up into six distinct currents, the flow in each being regulated by means of valves.

A reference to the drawing will explain how this is done, and will also show that the two units can be worked either in parallel or in series, and also that the inlets and outlets are reversible. When first these condensers were started, it was found that their action was far from satisfactory, as it was impossible to reduce the gas to the proper temperature, or to regulate the temperatures in the various sections. An occasional examination of the interiors showed this to be due to a deposition of a mixture of tar and naphthalene on the exterior of the water-tubes, varying in amounts in different parts of the apparatus. After trying by various means to do away with this difficulty, we determined to try (on the suggestion of my Chief Assistant) the effect of introducing at



Elevation. Plan.

Fig. 1.—The Water-Tube Condensers at the Croydon Gas-Works.

intervals at the top part of each section a quantity of water-gas tar. The result was so promising that we fitted the necessary pipes for carrying out the system on regular and systematic lines. Since doing so, we have had no difficulty in reducing the temperature of the gas in the various sections to a point only a few degrees above the temperature of the incoming cooling water.

A reference to the plan (fig. 1) will show how the pipes were arranged. A is a vessel which is filled with water-gas tar, and has its outlet connected up to the pipes B, from which run a series of smaller pipes C, which pass through the top part of the outer casing of the condensers and between the vertical water-tubes. These pipes are perforated on their sides, slightly above the centres, by holes increasing in size from 1-32 inch just inside the condenser to 1-16 inch at the far end.

At stated intervals—generally twice during the day—the tank A is filled with water-gas tar, and put under a pressure of 80 lbs. per square inch, by means of the compressor plant used for raising water from our artesian wells. When this pressure is obtained, the cock on the outlet of the tank is opened, and the tar is forced through the openings in the pipes C, and sprayed over the outer surfaces of the water-pipes down which it runs, thus keeping them perfectly free from deposit of any sort. After some time, it is found that the temperature of the outlet gas begins to rise, and the flow of gas and water is then reversed. It should be said that we obtain the best results when admitting the gas at the outlets, and allowing it to pass downward to the inlets with the water flowing, of course, in the opposite direction. The reversed action is allowed to continue for about four hours, when the original conditions are reverted to. It is found that some deposit occasionally forms at the bottom of the tubes and in the short inlet pipes D, and that this accounts for the rise in the temperature. At the time of reversing, therefore, a stream of water-gas tar, put under pressure in the manner before described, is sprayed into the inlet cylinder through the pipes E, perforated opposite the gas inlets which are turned round during the operation. By this means the inlets are effectively cleared, as are the bottoms of the water-tubes. The operation of reversing and spraying takes place as a rule about twice a week.

When working in the manner first described, the naphthalene was effectually removed from the gas; but the tar which was thrown down was so rich in naphthalene that this hydrocarbon crystallized out in the colder portions of the apparatus, and thus formed an efficient non-conductor that prevented the proper cooling of the water from being obtained. For the success of the method, therefore, it is essential that some means similar to those described above should be adopted to prevent the accumulation of the pasty mass to any appreciable extent. This mass, though pasty when cold, becomes quite thin and liquid when slightly warmed, and is found to contain very little free carbon.

A glance at the following table will show the efficiency of the condensers as a whole.

Condenser Temperatures.

Year.	Month.	Gas Inlet Temp.	Gas Outlet Temp.	Difference.	Inlet Water Temp.	Outlet Water Temp.	Remarks.
1909	April	104° F.	63° F.	41° F.	53° F.	64° F.	One condenser at work.
	May	112	68	44	58	75	,,
	June	112	73	39*	65	79	,,
	July	120	75	45	64	79	,,
	Aug.	117	76	41	66	81	,,
	Sept.	114	74	40	68	83	,,
	Oct.	113	73	40	66	83	Two condensers at work.
	Nov.	112	67	45	59	79	,,
	Dec.	108	63	45	56	73	,,
1910	Jan.	103	61	42	56	73	,,
	Feb.	110	61	49	54	80	,,
	Mar.	103	60	43	56	70	,,

* Tar sprays choked and fresh sprays put in during this month.

It will be noticed that the difference in temperature between the outlet gas and the inlet water is greater when one condenser is at work. This is due to the fact that at these times the condenser is passing a much greater quantity of gas than it was designed to deal with.

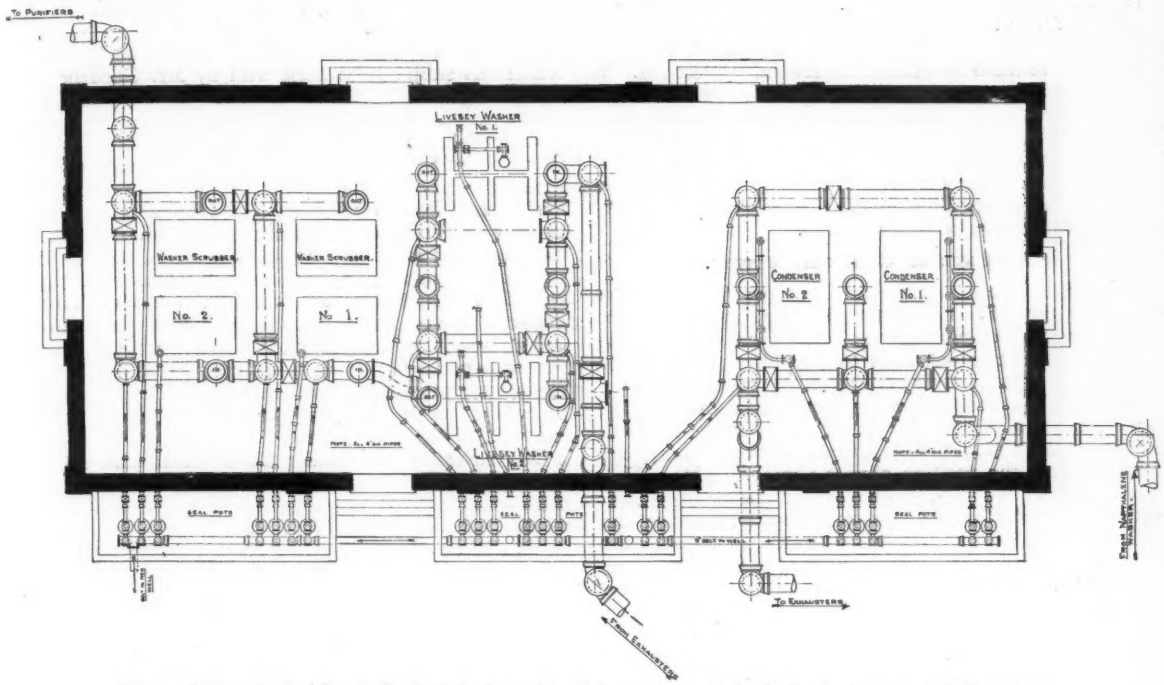


Fig. 2.—Arrangement of Tar Drains from Syphons, &c., to Seal-Pots for Mains in the Condenser and Washer House.

A reference to fig. 2 will show that the products of condensation, not only from the condensers, but from the whole of the scrubbing and washing plant run into receptacles, and from thence by gravity to the seal-pots, which are all placed outside the house, and subjected therefore to great variations of temperature. Many of the pipes leading to the seal-pots are of considerable length, and run in somewhat tortuous directions. We feared that they and the seal-pots might give trouble through getting stopped up, and we accordingly provided special means for dealing with such trouble if it arose. I can, however, honestly say that during the two-and-half years the section has been at work, the only time we have experienced any trouble from this cause was towards the end of one week during which we had to throw the Livesey washer containing the water-gas tar out of use. It will be noticed (see fig. 3) that the whole of the connections in the house are buried in the ground, the level of which is considerably higher than that of the yard outside. By keeping the connections just underneath the surface, we were not only enabled to adopt the plan of running the condensed liquid to the seal-pots by gravity, and thus avoid all pumping of syphons, but also to provide easy means of cleaning the connections by placing removable covers at the points at which they intersect. These covers are all easily accessible on lifting the shallow tiled frames which are fixed immediately over them. All the valves are also arranged with specially constructed bonnets, with their joints flush with the ground, so that they can be removed when necessary.

I am glad to say that we have not yet found it necessary to make much use of these special arrangements for the purpose for which they were provided, as occasional examination by their means of the internal conditions of the connections has always shown them to be in a clean and satisfactory condition. The same can be said of the interiors of the "Standard" washer-scrubbers, the discs of which are as free from naphthalene deposits as the day they were first started. I may also mention that the interior of the rotary meter which is used for registering the whole of the gas made in this section shows, when opened for examination, no signs of naphthalene.

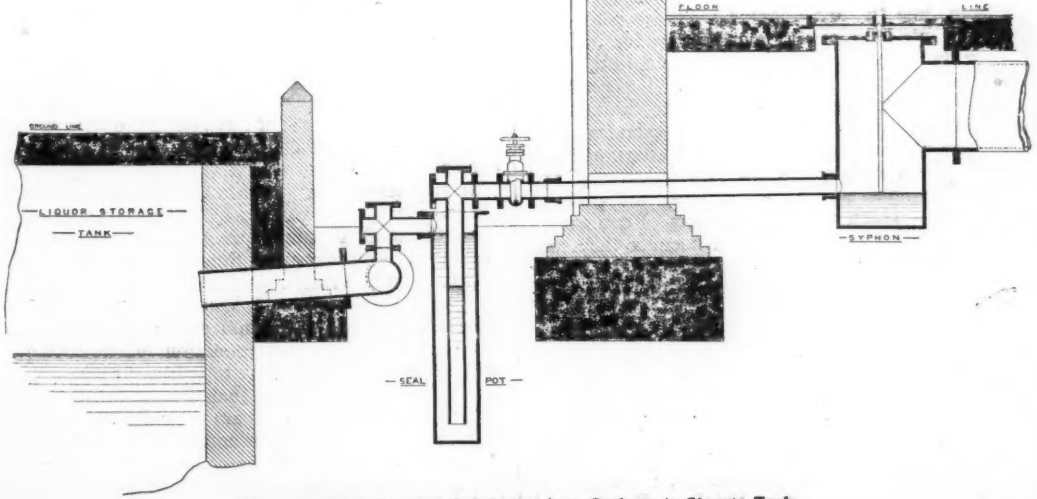


Fig. 3.—Method of Liquor Gravitation from Syphons to Storage Tank.

When the new section was first started, it was worked in conjunction with the old works, and advantage was taken of this circumstance to carefully test the gas made in both, and also to observe the conditions of the several connections. It may be said at once that the difference was most marked, as while the connections and plant in the new section remained (as they still remain) perfectly clear, those in the old works were frequently blocked, and had to be periodically opened for cleaning-out purposes; while the tables I have previously given of tests made by Dr. Colman indicate clearly the difference in the character of the two gases.

Importance of Combined Action.

And now I come to what to me forms the most important part of my remarks. I have already drawn attention to the great changes which have taken place in our industry during the past fifteen years—changes so smoothly, so insidiously, introduced that they have been almost unnoticeable, but yet so marked in their influence on our organization that if it were possible to reintroduce into the profession one who ceased all connection with it fifteen to twenty years ago he would find the position almost unrecognizable. Now have we, as an industry, so appreciated the changed conditions as to fully realize the necessity for altering our methods to suit them? Individually perhaps we have; but have we done so collectively; have we as an industry, representing a paid-up capital of more than £130,000,000, realized the importance of combined action in matters in which our mutual interests are concerned? I venture to say that there can be but one answer to such an inquiry, and that must be both negative and unfavourable.

It will be noticed that I am approaching this matter not from the standpoint of the individual or of the individual company or undertaking, but from the point of view of what should be a combined industry, composed of units not competing against each other, but all desirous of attaining the same end—namely, the production of the most suitable gas, and the introduction of the most suitable methods and appliances for economically making use of it.

The importance of adopting methods which will appeal to the consumer, and convince him that it is not only a gas company's duty, but its desire, to give him every possible attention and help, and not to harass him with undue and unbusinesslike restrictions and formalities, cannot be overestimated; and although it is the distributing engineer, his inspectors, and staff, who come more closely into contact with him, yet much depends upon the tact displayed in the secretarial department to which a dissatisfied or anxious consumer frequently applies when he is desirous of making arrangements for a supply of gas, or when anxious to ascertain the reason why such supply of gas, when secured, has resulted in the delivery of an account somewhat in excess of his anticipations. Look at it as we will, we must confess that more than ever the success of gas companies and the industry generally depends on the proper working of every department, and upon loyal co-operation on the part of the principal officials of each.

Competition and the Way to Meet it.

It is useless to disguise the fact that the competition with which we are faced to-day is powerful not only on account of its own innate strength, but also because of the methods which are from time to time adopted by those who cater for the public wants in competition with ourselves. It is, therefore, only by the most vigilant and up-to-date methods that we can hope to maintain our position. I say this in no pessimistic spirit, but because I deprecate the attitude which is sometimes assumed by companies who, because keen competition may not yet be felt in their own particular districts, are content, as they say, to "let well alone," and that other attitude—parochial in its nature, and perhaps more common still—which prompts directors of companies to refuse assistance to combined action because they consider that any money spent in propaganda work is thrown away unless it is spent in their own immediate neighbourhood.

Publicity Department.

Undoubtedly, one of the principal directions in which combined action can make its influence felt on our industry is in connection with the subject of advertising. This has long been recognized by our colleagues in America, where a special association has been formed for dealing with this side of our business; and the subject is now, I am glad to say, receiving the careful attention of the Joint Commercial Sections in this country, on the initiative of the Southern District Association.

You will all doubtless remember the masterly way in which this subject was dealt with by Mr. Goodenough, of the Gaslight and Coke Company, at the meeting of the Institution in Dublin in 1907. But it is evident that his remarks fell on unprepared soil; for until the effort of the Commercial Sections, to which I refer, no attempt has been made to deal with the matter in anything like a systematic way. Not that Mr. Goodenough has failed to put into practice the doctrines he himself preached. Supported by the Governor and Directors and the Head Officials of the Company he serves, a splendid system of advertisement has been instituted, having for its objects the education of the public in all matters dealing with the uses of gas for domestic and industrial purposes, and the dissemination of facts and figures regarding its advantages, and corrective of the many mis-statements which have from time to time been published as to its so-called disadvantages when compared with rival lighting and heating agents.

The advertisements and articles which during the past year or so have appeared in the Daily Press and the better-class periodicals have been as far-reaching in their influence as they have been expensive to the Company responsible for them. I am aware also that much splendid work in the same direction has been carried out by the South Metropolitan Gas Company. Now I cannot believe it just or fair that the industry as a whole should practically stand aloof and allow the whole expense of such useful propaganda work to be borne by one or two broad-minded companies, while the benefits of their action are shared by undertakings all over the country. Surely the cost of such work should be paid from a fund to which every gas company in the kingdom should contribute in proportion to its size and importance. I confess to there being some difficulty in dealing with the question in the case of corporations owning both the gas and electric undertakings; but this difficulty should surely not be insurmountable.

Importance of Securing Support of Directors.

Now before there can be any hope for successful combination, directors and committees of gas companies and gas undertakings must have the assurance that the body or institution which sets itself the task of carrying on any organized work is thoroughly representative of the whole of the various interests of their several concerns. It is only when directors and committees appreciate the fact that they are so represented that they will gain sufficient belief and confidence in the work which is being done on their behalf as to induce them to give to it not only their moral but their financial support. Here it seems to me we are face to face with a serious question; and though many of us may be inclined to regard it from a somewhat prejudiced and selfish point of view, yet it is one which has got to be approached from a purely unbiassed and unselfish standpoint, if we are to look forward with any confidence to attaining the desired end.

Is the Present Institution Representative of the Industry?

May I ask you to consider a question which I have often of late put to myself? Is an institution, the membership of which is confined to engineers and managers and their principal assistants—to those only, therefore, who are connected with the technical side of our business—really representative of our industry under the conditions which now exist? Whatever might have been the answer to this question even ten or fifteen years ago, there is, I think, only one possible answer to it to-day, and that in the negative.

It may seem strange that one who took a somewhat prominent share, only some eight or nine years ago, in bringing about the amalgamation of the two existing bodies, and whose main plea for fusion was the formation of an Association which should be fully representative of the industry, should so soon afterwards have to confess that the end that he and others desired had not been accomplished. Nevertheless, I have no hesitation or compunction in confessing to such a want of foresight as led me to believe that the then contemplated fusion would do all that was required in the direction of full representation. I am now bound to acknowledge that, looked at broadly, our action, successful as it was from the point which its promoters then had in view, in its result had somewhat of an opposite effect, for it robbed the new body of the presence of many practical men whose assistance

could not have failed to act beneficially on the interests then under consideration.

Work of the Society of British Gas Industries.

I do not want it to be supposed that I regret the action which was taken at the time referred to, nor that I am intending to suggest any attempt at reviving the old conditions. The action of those engaged in the manufacture and supply of plant and materials in forming the Society of British Gas Industries renders such a suggestion unnecessary, even if I thought such revival was desirable. The way in which the Society has been worked, and the care and wisdom which have been displayed in the selection of its Presidents and Officers, fully warrant the belief that its formation will do more than fill any gap which the steps taken in connection with the amalgamation of 1902 may have caused. I need not relate in any detail the many instances in which the Society of British Gas Industries have shown their powers for good by joining with our Institution in promoting, by joint action, matters in which their mutual interests, and therefore the interests of the industry, have been concerned. I have quite come to the conclusion that co-operative methods rightly applied are likely to be productive of as much, if not more, benefit, than could result from any such system of combination as existed prior to the amalgamation. And this view is, I believe, shared by our colleagues in the Society of British Gas Industries.

The two bodies have ever shown themselves ready to combine for the consideration of matters affecting their interests, and I have every confidence in believing that this readiness will be even more marked and productive of more good in the future than has been the case in the past. If my views are sound, as I believe they are, there is every assurance that the practical and technical side of our work will be fully looked after and safeguarded. I maintain, however, that even with this condition assured, we are far from possessing such an organization as can be considered fully representative of the many sides of our business. It must, I think, be apparent to all—not only from what I have said, but from the knowledge which comes to anyone who will allow himself to fairly review the position—that the changes which have gradually but surely taken place in the conditions that govern the administration of gas companies and undertakings necessitate drastic changes in the methods of meeting them. One of the greatest of these changes must consist in a full appreciation of the fact that while in the olden days individual effort was as a rule found sufficient to maintain the position of gas undertakings throughout the country, it now becomes more and more apparent that, in order to maintain our position, organization and combination, with its resulting systematic treatment of matters of moment, must supplement (though not entirely supplant) the individual and sometimes haphazard methods of to-day.

Suggested Change in Constitution of Institution.

Now how can this combination be best secured? I have already stated that it is quite impossible unless we get the help and assistance of the heads of all the principal departments of our concerns, and through them the confidence and resultant support of the directors and committees under whom we work. Now it must I think by this time be apparent that I am about to suggest that any Institution claiming to represent the industry must include not only engineers and managers, but also the heads of the two other principal departments—the secretarial and the distribution. With regard to the last-named, it would appear from certain elections which have taken place during the past year or so that the Council have interpreted the clause in our Articles dealing with the qualifications for membership with sufficient generosity to admit several of those who are at the heads of the distributing work of large companies; and although I am of opinion that, when drawn up, the qualification was not perhaps intended to cover such cases, I am personally glad that such a course has been taken, as I feel sure that the only reason for so wording the Article in question as to require any broadening of interpretation was to be found in the fact that at the time of its construction the importance of the distribution branch was not sufficiently appreciated.

But although the question of the admission of such officials may have been satisfactorily dealt with under our existing Articles, yet it is certain that in no way can the qualification paragraphs be read as to allow them to include the election of those in charge of the secretarial and the accounting departments. I am, therefore, convinced that, before this could be done, certain amendments of our Articles are absolutely necessary, and that such alterations must result in a considerable change in our constitution. And here I cannot refrain from mentioning an argument used by the secretary of a large and important company, when speaking to me of our constitution from a somewhat personal point of view. "Your Articles," he said, "permit of the election of managers of gas companies however small, but cannot be so interpreted as to admit the secretaries of even the largest companies. I should not feel that I had any cause for complaint if your Institution were content to deal with purely engineering and technical matters; but when, as is often the case, your body discusses matters of commercial and financial administration, and is unable under its rules to admit the presence and assistance in debate of those who are, by their experience, peculiarly qualified to add to the value of the discussion, then I think you are not only dealing unfairly with such men as myself, but you are detracting from the value of your debates, and to a certain extent alienating the sympathies of the concerns in the management of which we take no unimportant share." I could not honestly object to the soundness of this argument, nor do I think it would be easy for anyone present to find a suitable rejoinder.

Affiliated Associations.

Another argument in favour of the enlargement of our constitution may be found in the growing importance of the Commercial Sections of Affiliated Associations, to which I have already alluded. It must, I think, be acknowledged that the useful work done by these sections is considerable, and that it will become much more so in the near future. Yet those sections which have so far taken the most prominent part in such work have admitted to membership secretaries and others who are not qualified for membership in their District Associations. Others recognize the position by providing for the occasional admission to their meetings, under certain restrictions, of officials who, while ineligible for membership of the Association itself, are considered, on account of their special knowledge, able to bring useful information to bear upon the matter under consideration at the time. This latter is surely a somewhat grudging and ungracious way of dealing with the difficulty, and one that is not likely to secure the useful co-operation of the officials concerned.

I want it to be distinctly understood that what I have so far said, and what I am about to say, is simply a statement of the conclusions at which I have arrived after a careful review of existing conditions. Though it is more than probable that my suggestions will not appeal to many of you, I think you will all agree with me as to the general principle which I venture to lay down, and which is that something is needed to strengthen our position and to secure for the work of an organization claiming to represent our industry a stronger financial position than can possibly be obtained by means of the annual subscriptions of some 850 members at a guinea each, and the amounts contributed to our Special Purposes Fund by the all too few broad-minded undertakings which recognize their responsibilities.

Suggested Procedure as to Enlargement of Constitution.

Although I do not hesitate to state my opinion as to how the desired result can be arrived at, I am by no means wedded to my views; and if any member or members can suggest some method whereby the desired end can be better or more conveniently attained, I shall be quite willing to accept, as an alternative, any scheme which may commend itself to the members generally. If, however, my suggestions are thought worthy of further consideration, with a view to their possible adoption in some form or other, then it appears to me that there are two courses open to us—either, first, to so alter our present Articles as to allow of the admission of those officials to whom I have referred and who are now ineligible under our rules, and to allow the Institution to continue under its present title, or, secondly, to change the name of our body to (say) "The Gas Institute" and to divide it up into sections (as is done with the British Association) for the purposes of detailed work.

The former course is naturally the simpler; but I am afraid it is open to the objection that it would mean the continuation of a body under a title which must be considered a misnomer. The second course is the one I personally favour,

as it would I believe result in the formation of a powerful and numerically strong body, thoroughly representative of the various interests concerned, and therefore particularly well calculated to secure the co-operation of the various officials and the consequent confidence and financial support of the companies and undertakings they serve.

I do not want it to be supposed that I advocate the indiscriminate election of the officials at the head of the secretarial and distribution departments. Different methods of administration are adopted in various undertakings, and special care would have to be observed to see that only those should be deemed eligible whose positions and attainments were such as to fulfil certain necessary qualifications, which would have to be carefully considered and defined.

Objection to Multiplication of Societies.

It may be urged by those who differ from my views, but who yet admit the soundness of my general principle, that a better way out of the difficulty would be to bring about the formation of another body, composed of those officials to whom I have alluded, which could co-operate with us on matters of finance and general administration. To such I suggest that already several bodies working in the same interests exist, and to add to their number, I cannot help thinking, would be most inadvisable. Personally, I would rather advocate the handing over to the enlarged body of the work now done by such societies as the Gas Companies Protection Association, and the Sulphate of Ammonia Committee. I am, however, bound to acknowledge that there are many difficulties in the way of this being done.

I am only too well aware that I am bringing this scheme before you in a very vague and general way. I, however, purposely refrain from entering into any details as to the best way of carrying it into effect, as I think that, should my suggestions eventually find any favour with you, it would be well to refer the whole question for the consideration and report of the Council or else of a specially appointed Sub-Committee.

Suggested Meeting of Directors.

I am perhaps a little sanguine in venturing to hope that the proposed widening of our constitution would in itself lead to a fuller appreciation on the part of directors and others of the good work which such an organization would, if accorded their moral and financial support, be capable of doing on behalf of the industry. It is indeed probable that it would be advisable to bring the matter more directly before them, at a meeting specially called for the purpose. This could be best brought about if a few prominent members of the boards and committees of gas undertakings who appreciate the position would so far interest themselves as to take the initiative in convening such a meeting. I believe that if this were done, and the whole matter patiently discussed and considered in all its bearings, the importance of combined action, and the necessity for providing the funds which would be required to render such action useful in the interests of the gas industry, would be readily realized and appreciated.

Conclusion.

In conclusion, may I say how fully I recognize the inconclusive way in which I have dealt with the task I set myself. I feel, however, that my endeavours, and your patience, will not have been entirely thrown away if anything I may have said will have the effect of awakening the members of our profession to the importance of putting on one side the old belief that dividends are made in the retort-house, and of causing them to realize the fact that the changed conditions of to-day render it more necessary than ever before that the sympathies and help of our directors and the knowledge and experience of the heads of all departments should be utilized in a combined effort to further the progress of the industry which we represent.

MODERN GAS-ENGINES AND GAS PRODUCERS.*

The volume under review is yet another of the works on the gas-engine, on which subject American writers have of late become most prolific. It would seem as though the future of the gas-engine in the United States is likely to be a bright one if the number of available reference books is any criterion. American writers on this subject have one common characteristic, and that is in the matter of coal gas as a fuel for the gas-engine. Their knowledge of coal gas, both in the matter of its manufacture and its properties as a fuel for the internal combustion engine, is of the scantiest possible description. This is shown either in a total neglect of this important fuel or, where a few paragraphs are devoted to the subject, in the ignorant manner in which the details are strung together. Perhaps it is that American makers and users of the gas-engine, owing to the prevalence of natural gas and the cheapness of oil, have a small opinion of the commercial uses in their country of coal gas as a fuel. In any case, it speaks badly of the American gas engineer's enterprise that he allows the product of his manufacture to be passed over in this manner. Mr. Levin's book is no exception to the rule. But for the inclusion of a few elementary details coal gas might be an obscure type of gas whose existence was hardly known.

The book is almost entirely confined to the design of the gas-engine and the theory of its working. A user purchasing the book in the hope of improving his practical knowledge as to the best manner in which to run his engine will be doomed to disappointment. The reviewer is of opinion that the volume will be a useful one to the practical designer and the student studying the theory of the design and working of the gas-engine. It is full of useful formulæ, and, as the author puts it, it is often the formulæ which the designer requires most. But he goes further and claims that "any engineer who wants to know something about his engine needs them as much." Here the reviewer disagrees, and cannot admit that the user of the gas-engine, except, perhaps, on a very large scale, requires such formulæ as are given to anything like the same extent as the designer. No doubt a knowledge of the method by which the necessary strength of the various parts of an engine may be calculated is a very excellent acquirement; but the writer fails to see that a study of the subject would be of any great practical use to the ordinary engineer who has a good few gas-engines under his control.

In his preface the author very rightly points out that the extended use of the gas-engine will have the effect of conserving our coal resources, especially in the direction of using the inferior grades unsuited for purposes of steam-raising. In developing the gas-engine industry this important point must ever be kept to the fore. This same inferior type of coal, if suitable for the producer, will also be suitable for the gas-retort as soon as the illuminating power bogie is finally dispelled, and will thus open up immeasurable possibilities in the way of cheap power and heating gas more suited and more economical for engines than producer gas with its 70 per cent. of useless constituents.

The author states that the information contained in the book consisted originally of a collection of notes which have now been, with the addition of the necessary elementary matter, extended to make them generally readable. The volume (which contains a mass of information) is arranged in fifteen chapters, with an Appendix. Chapter I. is devoted to "Thermodynamics," and is followed by chapters on "Design Constants and Formulæ," "Theoretical Analyses of the Gas-Engine Cycles," and one on "Power, Size, and Speed of Gas-Engines." The author then confines his attention to the various fuels in use, Chapter V. being entitled "Fuels Combustion;" and the two following are concerned with the best known spirits and gases in general use. From Chapter VIII., which deals with the "Features of the Practical Gas-Engine Cycle," the work gives in detail much information as to the design of fly-wheels, crank-shafts, governors, and other parts and auxiliaries of the internal combustion engine. The main features of a large variety of different makes of gas-engines are explained and illustrated in Chapter XIV. The final chapter deals with the important details of "Producer-Gas and Gas-Producers," and the necessary auxiliary plant.

The book is well written; and it is not difficult to gather, from the manner in which the subject is handled, that under the guise of the author may be seen a practical and experienced designer with a very thorough grasp of the theory of his subject.

* The Modern Gas-Engine and the Gas Producer. By A. M. Levin, M.E. New York: John Wiley and Sons. London: Chapman and Hall, Limited; 1910.

Flow of Water in Curved Pipes.—In a paper on this subject recently read by Mr. John Eustice before the Royal Society, the author said that experiments were made on a flexible tube with the object of ascertaining the increased resistance to the flow of water which was due to the curvilinear motion of the water in coils of uniform radius. The tube, which was about 0·37 centimetre internal diameter in its normal condition, was sufficiently small to admit readily of experiments both below and above the critical velocity. In order to separate the effect of curvature and change of cross-section, special apparatus was employed to change the section of the straight tube from circular to oval form. Comparisons were made between the flow in the straight tube and the flow when the tube was coiled—both tubes being of the same form and area of section. The results obtained show that the flow in a straight flexible tube of circular section follows the laws of flow in metal tubes as investigated by Professor Osborne Reynolds, and that the velocity at which turbulence begins is given by his formula; and that the critical velocity, which is so well marked in the flow in a straight tube, appears to be entirely absent when the tube is coiled—that is to say, the index law for straight tubes does not hold for coiled ones.

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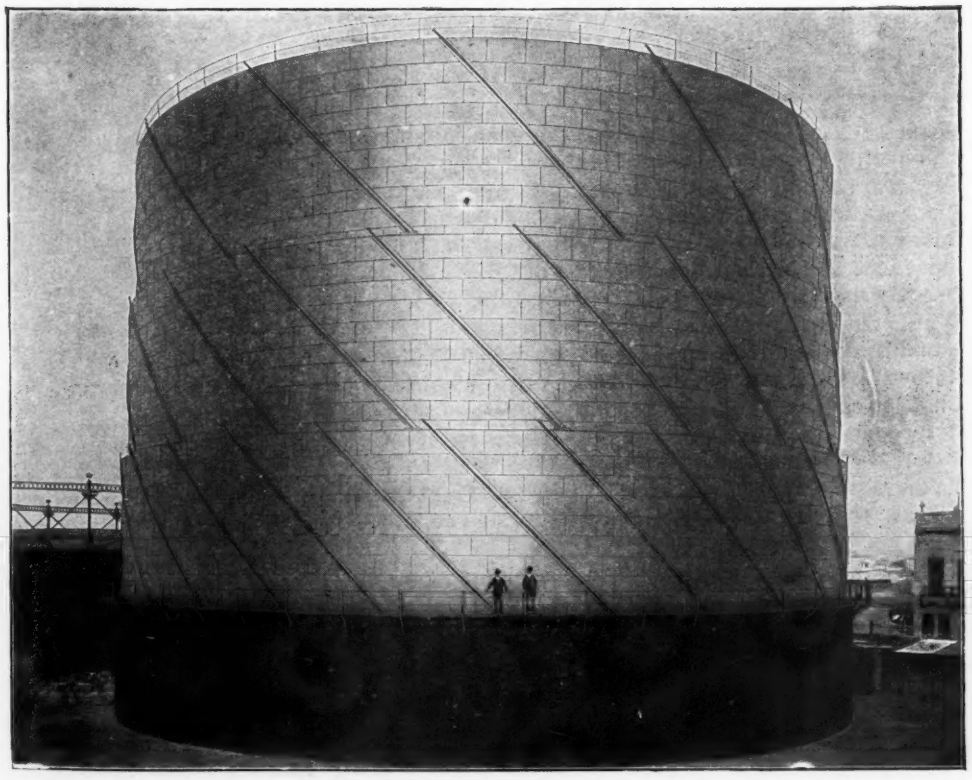

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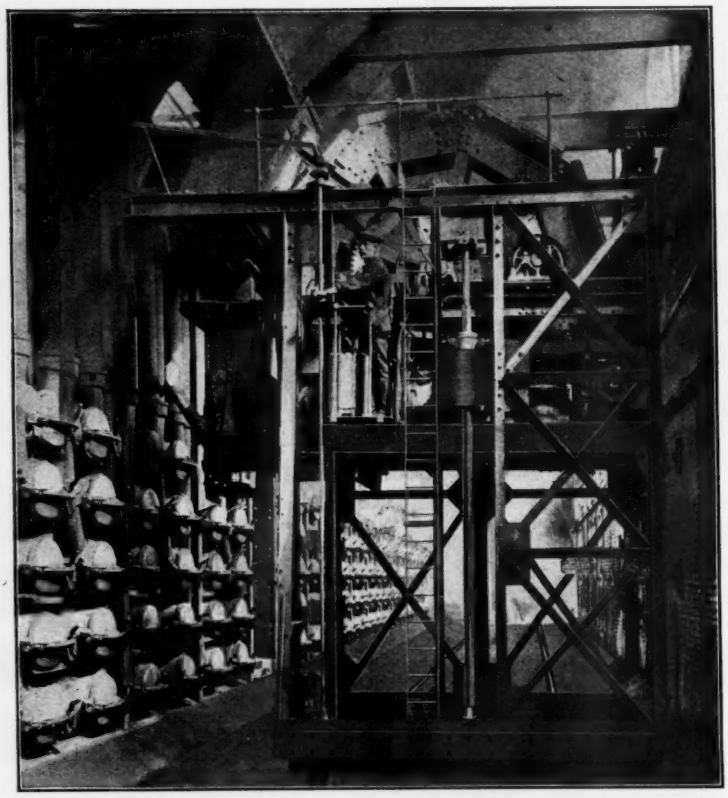

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WHAT IT DOES:

Discharges and Charges Retorts of any length simultaneously with one Stroke.
Can perform either operation independently.
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LARGE CANDLE-POWER HIGH-PRESSURE UNITS.

On View in London.

LAST week, in this office, a prominent gas and electricity administrator from America remarked in the course of conversation: "You have made some wonderful advances in high-pressure inverted gas-lighting in this country." The observation is true; and our visitor was in a position to realize it after years of absence better perhaps than we are able to do who have seen the advances tentatively introduced, and have been almost unconscious of the large expansion there has gradually been from the small beginnings. Not only was our American friend attracted and interested last week in the demonstrated progress of gas lighting, but it will be seen, from a paragraph in an earlier column, that the gas-lighted thoroughfares of Fleet Street, Whitehall, and Parliament Square, especially, among the lights of London, claimed the notice of the occupants of the Army dirigible that unexpectedly passed over sleeping London not many nights since. If the visitors to the Institution meeting this week can snatch an hour or two from pleasure after dark one night, they will have something worth inspecting at Aldwych, where some trial high-pressure, high-power Keith lamps have been installed—of higher power, in fact, in single units, than have ever been installed in London streets before. Then they can pass down Fleet Street, and see the high-pressure inverted lamps in use there; and, walking to Blackfriars Bridge Approach, there will be seen sample high-pressure lamps with raising and lowering gear, demonstrating to the City authorities that for the lighting and maintenance of high-pressure lamps ordinary or trolley ladders can be dispensed with if they prefer that City streets should be free of such *impedimenta*. The lighting of Blackfriars Bridge is worth inspection. Then a tramcar ride as far as Westminster Bridge will bring the visitors to the lighting of Parliament Square; and thence a walk through Whitehall will not fail to interest. That is by way of suggestion.

It is to the trial lamps that are to be seen in Aldwych for which special attention is desired, because they carry us to a point in the direction of high powers from a single source that has never yet been exceeded in the streets of London. Some local authorities will have high-power units in public places; and the gas industry, whatever may be thought as to the propriety from the scientific or other point of view, has to be prepared to provide what customers require. That is only common sense, and business. When the Westminster lighting contract was under discussion, and the Gaslight and Coke Company contracted, among other units, for some 3000-candle power ones, certain gratuitous electrical advisers and careless critics ridiculed the idea of a gas-lamp standing anything like that power. They had never seen (because they had not looked for it) such a lamp; they questioned the possibility even of such a lamp being made; and what the Gaslight and Coke Company had been thinking about to bind themselves to provide something that (in the electrical imagination) did not exist, was utterly inexplicable to the electricians. But here we are. Already the Gaslight and Coke Company, with the assistance of the James Keith and Blackman Company, Limited, have fixed high-power lamps in Aldwych, ranging from 4500 to 2000 candle power per unit. These lamps have been put up purely as specimens, first to convince all interested that they will be suitable for their destined purpose, both as far as illuminating value and design are concerned, and to give an opportunity for experimenting by the Company and the makers under actual street conditions. And the nocturnal electrical wanderers, with their photometers, will soon be swarming round these lamps to see what prospects there are of the Company being able, at the angles—20° and 50° below the horizontal—chosen by the Westminster City Council, to maintain their contract illumination.

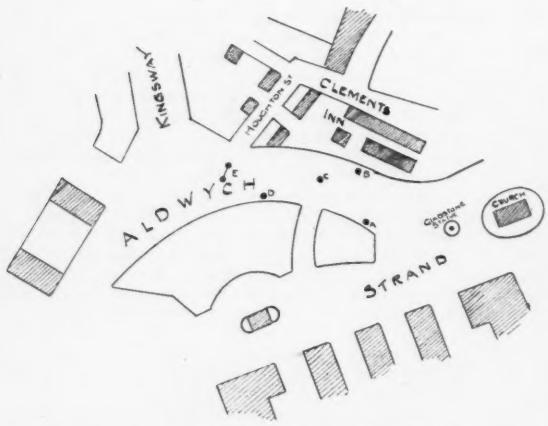
Passing from the Strand into Aldwych, the first of the trial lamps to arrest attention is on the first refuge. This is one of Keith's nominal 4500-candle power (column pattern) lamps, fitted with three 1500-candle power inverted burners. Then on the left-hand side walk, there is a similar lamp containing three 1000-candle power inverted burners. Following on, there are two lamps—one on the left-hand and one on the right-hand side walk—demonstrating the types of lamps for suspension from swan necks; these also containing three 1000-candle power inverted burners. Succeeding, there is the second refuge, the column on which carries a double-arm bracket; and depending from this are two lamps, each containing two 1000-candle power burners.

Based on the experiences of the past, a few new features have been introduced into the column form of lamp; and these it is of interest to note. In the first place, each burner has its own separate heater, forming one-third of the circle. Then each burner has its injector body so fashioned as to allow it to be fixed in a horizontal position, with the portion carrying the nipple slightly projecting beyond the outer enamelled casing, so that both the nipple and the burner body can be cleaned without in any way disturbing the lamp. The adjustment screws of each burner are also brought below the reflector; so they are readily accessible. The upper enamelled cased portion of the lamp is merely utilized partly as air and partly as exhaust ways. The lamps as now fixed are provided with automatic lighting devices—the column lamps being divided so that one control valve on one side arm controls one burner and bye-pass, and a control valve on the other side arm deals with the other two burners. This convenience enables the lighting per lamp to be reduced to one or two burners at midnight, if desired. But this is not the system that will be in use in the Westminster district, as there the contract provides for the full power of the lamps being maintained throughout the lighting hours.

The photographic illustration of one of the column lamps shows a design that is not by any means unattractive, and yet it is of substantial build, and will, it is obvious, give a good account of itself under all the climatic severities to which it will be exposed. It will be observed that the two side arms are attached to, and carry, a heavy cast-iron enamelled reflector, on which the whole of the lamp is built. Instead of being of the ordinary enamelled circular type, the reflector is made with a copper frame and opal glass glazing—the panes being quite outside the heat range, and at an angle that will best meet the illuminating requirements. On the whole, the James Keith and Blackman Company look upon this design of lamp as the finest they have yet made; and in regard to it, with the photographic reproduction before readers, nothing more need be said.

The first of these trial lamps—the nominal 4500-candle power one—was put into lighting on Monday last week; and night by night it has attracted a considerable amount of attention, apart from those who went to view it specially to judge of its performance and general effect. All who saw it appeared to be pleased; and no expressions of opinion were heard that were not favourable. The colour of the light and its diffusion were good; and the light was perfectly steady. Taking a clear point of view from the farther side of the Strand, the life and power of these lamps stand out in striking contrast to the flame arcs on the neighbouring skating-rink.

These lamps, like electric lamps, have been designed and are made to be used under certain conditions. There is the necessary pressure—that is to say, a certain pressure is required at the lamp head; and this pressure may not be, owing to friction and obstruction between the compressing-station and the lamps, the initial pressure at the compressors. There is also the question of the calorific power of the gas. The burners are adjusted for a certain consumption of a certain quality of gas; and if this quality is kept fairly uniform, and the pressure is the pressure desired, then the lamps will produce actually—at any rate, approximately—their nominal illuminating power. In the Gaslight and Coke Company's district, the calorific power is kept fairly uniform now—the Company being under a penalty test in regard thereto; and as to the pressure the Company are prepared to give the Keith lamps all the margin that is needed to compensate for any reduction of pressure between the compressors and the lamps in the Westminster area. Some gas engineers who have been brought up with a pious affection for tenths and up to 2 to 3 inches pressure, stand almost aghast when there is talk of pressures running up to 70 or 80 inches of water. Readily, the Gaslight and Coke Company have conceded the makers' desire to have the compressing plant for the Westminster lighting regulated so as to discharge gas at 80 inches pressure; and this will give an ample



Plan Showing the Positions of the Trial Lamps in Aldwych for the Gaslight and Coke Company.

A. Column Pattern Lamp with Three Burners, each of 1000 candle power.
B. Suspension Lamp in Harp with Two Burners, each of 1500 candle power.
C. Column Pattern Lamp with Three Burners, each of 1500 candle power.
D. Suspension Lamp on Swan-Neck Bracket with Two Burners, each of 1500 candle power.
E. Two Suspension Lamps on Double Swan-Neck Bracket, each with Two Burners of 1000 candle power.

margin in pressure. Under the circumstance of conditions meeting requirements, so giving a proper flame and a high flame temperature, and with the improvements in the Keith lamps, there will be no doubt as to these showing efficiencies higher than anything the firm have previously produced.

It may be added that for the Westminster high-pressure lighting, the compressing plant will be situated at the Gas Company's Horseferry Road station, and will consist of four of Keith's rotary compressors. Provision is in this way made for all variations in requirement likely to be met with—at any rate, for a time. Each compressor will have a suitable gas-engine alongside it. The gas-engines will drive on to a common shaft, and from the shaft to the compressors. This will make a most interchangeable plant—capable of dealing with a 5000 cubic feet per hour day load and (if necessary) a 55,000 cubic feet night load. There is confidence that this Westminster lighting contract is going to confer an important benefit on street illumination by gas in connection with the more stressful competition of the lights at the present time.

IMPROVED LIGHTING AT STOKE-ON-TRENT.

Some few weeks ago, mention was made in the columns of the "Journal" that the Gas Committee of the Corporation of Stoke-on-Trent had placed an order with Messrs. D. Anderson and Co. for a considerable number of their "Dacolight" patent regenerative inverted burner lamps for re-lighting the principal streets of the borough. The work has now been completed under the direction and superintendence of the Engineer, Mr. W. Prince.

The installation consists of 98 two-light lamps, six four-light, and four three-light; the latter being used for lighting the open space around the Campbell Monument. The others are fixed throughout the district; and in all about 2½ miles of streets have been covered. A total illuminating effect of 32,480 candles is provided. The lamps are lighted and extinguished automatically from the gas-works on the Alder and Mackay system, which method has been in use for some time at Stoke—the controllers being adapted to the new lamps.

In carrying out the installation, Mr. Prince has taken the opportunity to re-arrange the lamp standards in the respective streets, and to provide some additions, so that the average distance from lamp to lamp is 40 yards. The result is most gratifying; and the greatly improved illuminating effect is highly commended, affording much satisfaction to the members of the Committee.

The illustration accompanying this article is from a photograph taken at night, and shows how well the roadways are now lighted. It will be noticed that the effect around the Campbell Monument is particularly good—both as regards the ground illumination and the effect on the monument, and the fronts of houses opposite.

The following figures may be of interest as regards the annual cost of lighting the 2½ miles of streets alluded to above. On the basis of the lighting hours being 3400 per annum, with half the burners out at 11.30 each night, it works out as follows, with gas at 2s. net per 1000 cubic feet—the present price in the borough:

Gas, including flash lights, and the extra gas used when the pressure is put on for the operations of lighting and extinguishing	£227 0 0
Labour, cleaning lamps and burners, remantling, supervision, and inspection, at 35s. per week	91 0 0
	£318 0 0

High-Power Gas Lighting at Stoke-on-Trent.

With regard to the cost of mantles, &c., it is too early to state definitely; but from the experience at present (two months), it will work out under five per burner per annum. The cost of these, together with glasses and other renewals incidental to the upkeep of the installation, is estimated at £25 per annum. This makes a total of £343 per annum.

Further examination of these figures is necessary in order to realize what this means. The majority of the lamps in use are two-light—each burner consuming 3½ cubic feet per hour; the illuminating efficiency per lamp being 280 candles. On this basis, the installation is equal to 116 two-light lamps; and the cost works out at less than £2 19s. 2d. per lamp per annum. For this, an illuminating effect of 280 candles is given up to 11.30 at night, and afterwards it is reduced by half until extinguishing time.

Readers will agree that these figures bear comparison with any low-pressure lighting installation in the country; and the gas authorities at Stoke-on-Trent are to be congratulated upon the success of the installation, as, in view of the figures, any competition from electricity is out of the question.

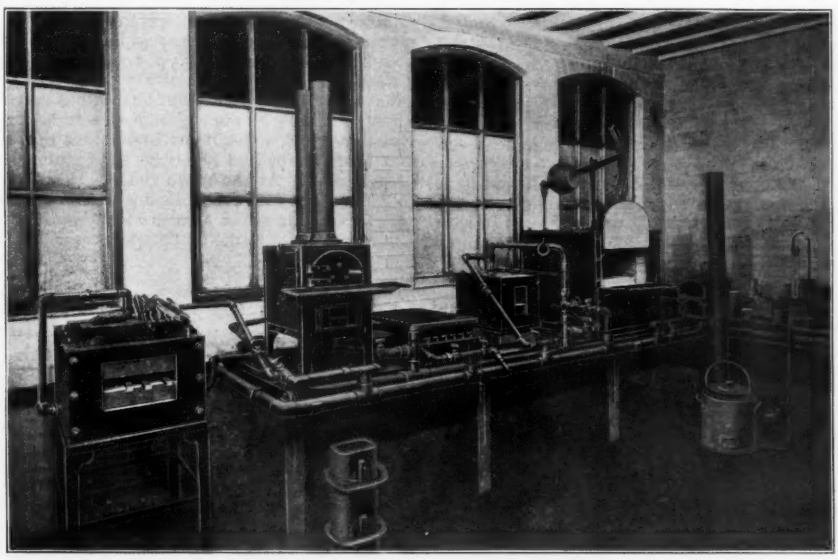
In the article on the "Public Lighting of Bethnal Green," which appeared in the "Journal" last week (p. 645), the name of the Borough Surveyor, who accompanied the Works Committee in their tour of inspection of the improved street lighting by gas in London, should have been Mr. A. E. Darby.

One of the latest of the useful pamphlets issued by the Anti-Socialist Union, of Victoria Street, S.W., is entitled "Co-Partnership." It furnishes a short account of the system, giving due prominence to the work of the late Sir George Livesey—who is justly styled "the pioneer of gas co-partnership," and cites recent examples of its adoption. The price of these pamphlets, in wrapper, is 1d. each.

GAS-HEATED FURNACES.

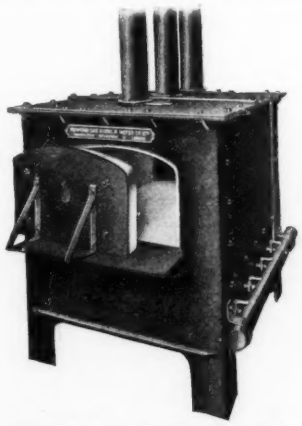
THE development of the industrial uses of gas is a direction in which, as previous articles in the "JOURNAL" have shown, we believe fruitful work can be done; and therefore we have pleasure in calling the attention of our readers to some interesting particulars relating to the subject received from the Richmond Gas Stove and Meter Company, Limited. The particulars have reference to the development of their gas-furnace department, with some general information concerning the construction and application of the furnaces they have supplied to some of the leading industrial concerns in the country. The Company will shortly issue a further comprehensive catalogue; their present one being confined to patented natural draught furnaces. From what we have before us as to the large number of furnaces of the later design already supplied for natural draught, gas with air blast, and high-pressure gas, there is sufficient evidence to convince one that the Company have a thorough grasp of the varied requirements in connection with modern manufacturing processes; and they may claim a conspicuous success in having supplied the largest plant in the country for gold and silver refining with town gas consumed in specially designed natural draught crucible furnaces, particulars of which will be given presently.

The Company are now, and have been for some time, giving close attention to experimental work in connection with the use of high-pressure gas for furnaces—a subject which has been referred to in previous articles. They draw a distinction between natural draught and blast, both of which may claim the most efficient and economical working results according to the duty required of them.



Special Room of the Sheffield Gas Company, Fitted with Richmond's Furnaces, for Showing them in Action to Manufacturers.

Gaseous fuels and their superiority over direct-firing have been much discussed, with advantage to the former; and it should be emphasized that the same reasons apply to town gas supplied at a reduced price for industrial purposes for small furnace work. In many of the intricate mechanical heating processes, town gas is not always the cheapest fuel; but no other kind of fuel can be used with such advantages—advantages that completely outweigh the importance of the fuel account. The Richmond Company illustrate a case in point. A leading manufacturer using a natural-draught twin-oven annealing furnace (as illustrated) saved the cost of the furnace in a few months by being able to heat stamped hollow-ware gradually with an absolute uniform heat. The pre-heating chamber (upper oven) is heated with the waste products of the lower one; and the amount of work put through the furnace without any waste through fractures (all too common with the old method of annealing) passed the expectations of the user.



Type of Furnace Supplied to the Leading Manufacturing Silversmiths in Sheffield and Birmingham. The Twin-Oven above referred to has an Upper Oven of the Same Dimensions as the Lower.

This type of annealing furnace is worked most economically with natural draught. An oven furnace of the same type, having a single chamber measuring 36 in. deep and 24 in. wide by 12 in. high, may be maintained at a temperature of 800° C., with a consumption of 180 cubic feet of gas per hour (for the first hour-and-a-half about 600 cubic feet are required to thoroughly heat the brickwork).

The series of natural draught crucible melting-furnaces are also of a very efficient character. The largest furnaces are worked with single giant burners, with an arrangement for pre-heating the air before it mingles with the flame. The combustion chamber and flues are so arranged as to obtain the highest efficiency possible, which is proved by the following results: Gold refining—Quantity in crucible, 400 oz.; gas consumption, 80 cubic feet; time taken, 24 minutes. Large installations of these crucible and annealing oven furnaces have been supplied to leading and well-known gold and silver refining firms in this country, and are giving the most satisfactory results.

Blast Oven Furnace.

There is a series of blast-oven furnaces particularly well adapted for hardening tools made of high-speed steel. In the furnaces of this class, gases (the products of combustion) surround the work

being treated; thus reducing oxidization to a minimum. The flame does not come into direct contact with the work as in forging furnaces. Twist drills, reamers, &c., which have a tendency to warp when heated, may be successfully treated in a vertical cylindrical furnace, worked with a cyclone flame. The articles are hung or placed vertically, and thus avoid flame contact.

All furnaces designed for gas with air blast may be also adapted to high-pressure gas, which in many cases is preferable.

Natural-draught furnaces are generally considered as being economical and preferable where heats not exceeding 800°C. are required for annealing purposes, provided the bulk and weight of the articles to be heated are not such as to cause sudden cooling down of the furnace in which they are heated.

The Richmond Gas Stove and Meter Company, Limited, have once more asserted, by the development of this gas-furnace department, their reputation for enterprise. They have supplied furnaces for the fitting up of permanent test-room installations at the Sheffield United Gaslight Company's furnace rooms, for the Newcastle and Gateshead Gas Company, and for the Glasgow Corporation Gas Department (Tradeston Works). These installations give a fair idea of their typical furnaces. There is scarcely an industrial town north of London and Bristol in which gas-furnaces may not be sold; and gas undertakings—company and corporation—will do well to give very serious consideration to this branch of business. The Sheffield Company have been very much alive to this new source of revenue; and there the furnace trade, as references at the meetings of the Company have shown, is being pushed with considerable success. Gas engineers and managers would, wherever situated, not be wasting time in looking into this interesting and important subject. The manufacturer is inclined to be reticent at times; but give him a reasonable chance of seeing a furnace in operation for test purposes at the gas-works or fitting shops, and it will certainly convince him far better than the most expert information.

Let it be remembered that many gas-furnace users are of more importance individually to the gas company (from a gas consumption point of view) than a street of 150 slot consumers, in support of which statement it may be added that there are now three firms alone, using Richmond gas-furnaces, who consume in the aggregate no less than 30 million cubic feet per annum.

PUBLIC LIGHTING—COMPETITION AND CHARGE.

A RETROSPECT AND A FORECAST.

[Communicated.]

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(*Continued from p.* 622.)

In this year (1862), in preparing the contracts for the public lighting, consideration was given as to the best means to be adopted for ensuring the full supply of gas to the public lamps. Dr. Letheby was of opinion that affixing meters was the best way of ensuring that the gas contracted for was supplied. It is worth remark that Dr. Letheby when he recommended meters, did not state that the proper quantity of gas was not given.

Experiments, however, were made with meters; and the evidence obtained showed that, when they were used, the Great Central Consumers' Company were giving more gas than was required by contract, and that another Company supplying the same district was giving less than the contract quantity. The following table shows the results of the tests on this Company's district. For the first three nights after the meters were affixed,

	Cubic Feet Per Hour.
Of the 31 meters to the 3-feet burners, 20 showed a consumption of	2·59
11 ,, ,,	3·33
The 6 meters affixed to the 5-feet burners showed a consumption of	4·68

It was not considered essential that meters should be affixed to each lamp; but the gas companies insisted upon this being done, if the charge was by meter. The lighting and maintenance were done by the local authority. The authority resolved to pay by meter, and to affix a meter to each lamp and assume the charge of lighting, cleaning, &c.

The results showed, with regard to the lamps fitted with carburators, those with meters gave about 58 per cent. more light than those without them; while without carburators the lamps with meters gave some 55 per cent. more light than those without them, consuming nominally 3 cubic feet of gas per hour, gave superior light to lamps without meters burning nominally 5 cubic feet per hour. This almost seems to imply that the worthy doctor had his doubts as to whether the burner nipples on the metered lamps had not been surreptitiously enlarged by the gas companies. At the same time, a series of pressure tests were taken. The four following are from a long list.

The results of the pressure tests showed the following readings, which are of interest by comparison with modern pressures.

	The Pressure had A Maximum.	A Minimum.
In the district of the Great Central Gas Company	19-10ths	7-10ths
In the district of the Chartered Company	14-10ths	6-10ths

The pressures were taken between sunset and sunrise only.

One method of testing the public lamps in 1862 for efficiency in illuminating power is interesting. It arose out of the question of the quantity of light given by public lamps varying considerably; the variation being not only between different lamps, but at the same lamp at different periods of the night, and would account partially for the extreme differences of opinion (then publicly stated) as to the efficiency or non-efficiency of the public lighting. It having been reported that there was a manifest difference between the light afforded by the lamps that had meters and those without, Dr. Letheby—the inventor of the photometer bearing his name—took circuits of inspection, and found it was very evident indeed. The means of a considerable number of rough observations were taken by Dr. Letheby to ascertain the distance at which a given object was visible, which showed that—

	Strength of Light. Without Meters. Yards.	With Meters. Yards.
At lamps *with** carburators (3 cubic feet per hour, contract supply)	4·378	5·512
At lamps *without* carburators (5 cubic feet per hour, contract supply)	4·758	5·925

* Naphtha carburators fixed to public lamps by the United Kingdom Carburating Gas Company.

Public Lamps.—Register of Pressures of Gas.

Date. 1862.	Time.	Situation.	Pressure. Lamps. With Meter.	Lamps. Without Meter.	With Carburators. Inlet.	With Carburators. Outlet.	Without Carburators. Inlet.	Without Carburators. Outlet.	Gas Company Supplying Lamps.
Oct. 8	11 P.M.	Opposite No. 31, St. Paul's Churchyard.	..	Yes.	11-10ths	11-10ths	..	..	Great Central.
,, 8	12 ,,		..	,,	10-10ths	10-10ths	..	..	
,, 9	1 A.M.		..	,,	10-10ths	10-10ths	..	..	
,, 9	2 ,,		..	,,	10-10ths	10-10ths	..	..	
,, 9	3 ,,		..	,,	10-10ths	10-10ths	..	..	
,, 9	4 ,,		..	,,	11-10ths	11-10ths	..	..	
,, 9	5 ,,		..	,,	12-10ths	12-10ths	..	..	
Oct. 8	11.15 A.M.	Opposite No. 26, St. Martin's-le-Grand.	..	Yes.	10-10ths	10-10ths	..	..	Great Central.
,, 8	12.15 ,,		..	,,	9-10ths	9-10ths	..	..	
,, 9	1.15 ,,		..	,,	9-10ths	9-10ths	..	..	
,, 9	2.15 ,,		..	,,	11-10ths	11-10ths	..	..	
,, 9	3.15 ,,		..	,,	11-10ths	11-10ths	..	..	
,, 9	4.15 ,,		..	,,	12-10ths	12-10ths	..	..	
,, 9	5.15 ,,		..	,,	12-10ths	12-10ths	..	..	
Oct. 8	11.30 P.M.	Opposite No. 10, Aldersgate Street.	..	Yes.	..	..	8-10ths	..	Chartered.
,, 9	12.30 A.M.		..	,,	..	..	8-10ths	..	
,, 9	1.30 ,,		..	,,	..	..	8-10ths	..	
,, 9	2.30 ,,		..	,,	..	..	8-10ths	..	
,, 9	3.30 ,,		..	,,	..	..	8-10ths	..	
,, 9	4.30 ,,		..	,,	..	..	8-10ths	..	
,, 9	5.30 ,,		..	,,	..	..	8-10ths	..	
Oct. 10	11.5 P.M.	Opposite No. 1, Princes Street.	..	Yes.	..	..	9-10ths	..	Chartered.
,, 12	12.5 A.M.		..	,,	..	..	8½-10ths	..	
,, 11	1.5 ,,		..	,,	..	..	7-10ths	..	
,, 11	2.5 ,,		..	,,	..	..	7-10ths	..	
,, 11	3.5 ,,		..	,,	..	..	7-10ths	..	

In the lighting contract for 1862 the details of illuminating power were omitted; and in their place the flame of the 5-feet batswing burner was described—viz.: "It was agreed and declared that the gauge of each burner shall be such as will, on the cock being turned full on at a pressure of 5-10ths, allow the quantity of 5 feet during each and every hour, and the dimensions of the flame of each light shall be not less, on an average, than three-and-a-half inches in width and two-and-three-quarters of an inch in height, and such flame shall be regular and nearly level." In the event of a burner consuming less than the quantity specified, the company were to be fined a sum of £20 in each case; and the authority were to have the power to remove burners to test and to affix meters. For the first time the parliamentary candle power was incorporated in the contract—*e.g.*: "The gas supplied shall be of the quality prescribed by the Metropolis Gas Act, 1860; and if the gas supplied by the company shall at any time be inferior in illuminating power, the company shall forfeit and pay the sum of £100 for each offence, and, in addition, £10 per day for each offence after notice."

In the lighting contracts for 1867, 1868, 1869, and 1870, instead of the flames of the batswing burners being required to be 3½ in. by 2¾ in. in size, it was specified that they be "regular and nearly level at the top"—a difficulty no doubt having been encountered in previous years in keeping the flame to the correct width and height. The clause enabling the authorities to come in and light with "oil or in any manner," in view of default, was still kept in the contract. Power to "assign or to part with the contract to any other company" was forbidden. The illuminating value of the light was to be of the "power prescribed by the 25th section of the Metropolis Gas Act, 1860. The benefits of clause 37 of this Act (giving special benefits to local boards) was also incorporated in contracts. But in the year 1870, section 54 of the Gas Act of 1868, with regard to price, was inserted in the contract. At this time, all "cockspur" burners were eliminated; and for the first time 6-feet burners were introduced, also power to fix carburators and meters. The unusual long list of penalties were kept in these contracts—viz., 20s. per burner for every burner not consuming the required amount of gas, 10s. per lantern that remained broken after twenty-four hours, 2s. 6d. per night for every lantern or burner not cleansed, 10s. for every lantern not painted, 10s. per burner per night for such burner as was not in lighting during the hours between sunset and sunrise.

In 1864, the question of public gas supply to lamps was dealt with exhaustively, and the prices which had now risen through the passing of the Metropolis Gas Act of 1860, had caused the "annihilation of competition" owing to the assignment of districts of supply to the thirteen Companies under the Act. For it was maintained that when, in 1822, Sir William Congreve (who was appointed to inquire on behalf of the Government into the lighting of the Metropolis) gave to the Metropolitan Gas Companies a well-defined district each, yet between this year and 1849 the prices for public lighting came steadily down in the 26 years from £5 5s. to £4 4s. for lamps consuming 5 feet of gas per hour. So much for the period of "districting."

From 1850 to 1860 there was ten years of unrestricted and cut-throat rivalry, known as the "competitive period," when the prices more rapidly fell from £4 4s. per 5-feet burner lamps in 1850 to £2 9s. 6d. in 1854. But on the introduction of the Metropolis Gas Act on Jan. 1, 1861, the price of gas was raised from 4s. to 4s. 6d. per 1000 cubic feet, although the Great Central Company had a bond with the local authority never to increase the cost beyond 4s. Gas was now 12½ per cent. higher than it was for twelve years previously, and the illuminating power was not so high as in the days of competition with gas at 4s.; while the annual price of the 5-feet lamps of the Chartered Company went up to £5 9s. 6d. each, or 4s. 6d. more per lamp than they were in 1823 with gas at 15s. per 1000 feet, and the Great Central Company charged £5 8s. 6d.

The difference in price charged for public lamps during the forty years ending 1862 is set out in the following table, showing it to be 84·03 per cent. dearer than in 1853—*i.e.*,

4·29	per cent. dearer than in	1823	
15·87	" " " "	1827	
21·66	" " " "	1832	
30·36	" " " "	1844	
41·29	" " " Great Central Company's price	1851	Competition period.
52·08	" " " Chartered Company's price	1852	
41·29	" " " Great Central Company's price		
84·03	" " " Chartered Company's price	1853	
73·81	" " " Great Central Company's price		
33·54	" " " Chartered Company's price	1856	
30·36	" " " Great Central Company's price		
24·43	" " " Chartered Company's price	1859	
21·66	" " " Great Central Company's price		
15·87	" " " Chartered Company's price	1862	

It was stated that from the period when gas was first used in the public lamps the companies supplying them dealt liberally with the local authorities, "for the ample light which was given is well recollected by those officers under whose observation it mostly came—indeed, it is only within the last few years that the diminished light has become a matter of notoriety, and the subject of incessant complaint by the public." It was the opinion that the falling off in the intensity of the public light, dated as far back as the year 1853, when the charge for the lamps was at the lowest point. These continued and grave defects that were "becoming a matter for public anxiety" was the cause of the introduction of meters for public lamps, before mentioned. It is interesting to note that the first meter was fixed on Sept. 2, 1862. To increase the illuminating value of the gas, carburating with naphtha at the public-lamp burner was resorted to, when the city authorities, in 1863, undertook the carburetting of the gas themselves, and saved in the southern district alone £1000 in that year.

For the 1864 lighting contracts, the three Companies before mentioned were approached, and tenders requested for lighting the streets. As before, specifications with the ordinary conditions were prepared; but the Companies took no notice whatever of them, and merely stated that they tendered under the conditions of the Metropolis Gas Act, 1861. The authority, having the "bond" with the Great Central Company, endeavoured to put it in force; but in the case of *Great Central Consumers Company v. Clarke*, taken in the Court of Common Pleas at Westminster for the purpose of testing it, the Judges of the Court decided, on Dec. 6, 1862, that the Metropolis Gas Act, 1860, did override the agreement entered into by the Great Central Company, and they were empowered to advance the price of gas. This judgment was confirmed by the Court of Exchequer Chamber.

(*To be continued.*)

ASSOCIATION OF GAS AND WATER ENGINEERS OF AUSTRIA-HUNGARY.

Annual General Meeting at Innsbruck.

The Twenty-Ninth Annual General Meeting of the Association was held at Innsbruck on the 26th to the 29th ult., and was attended by some 120 members and guests.

The customary reception was held on the evening of the 26th ult. by Herr Anzböck, of Vienna, who represented the President of the Association—Professor Friedrich, of Vienna, who was unavoidably detained elsewhere. Speeches of welcome to the Association were made by representatives of the Municipality, and an appropriate reply was made by the Chairman. Dr. Blum, of Berlin, one of the Honorary Members of the Association, also spoke. The technical proceedings commenced the following day, under the chairmanship of Herr Anzböck, of the Imperial Continental Gas Association's works at Vienna, who delivered an inaugural address of welcome. He was followed by Councillor Krapf, who spoke on behalf of the government of the district. Other complimentary addresses followed; and the Chairman then presented the annual report of the Association. From this it appeared that there were now 356 members, and that two important pieces of work had been carried out by the Association in the course of the past year. One was the establishment of an experimental works for the investigation of gas-lighting, fuels, and furnace plant, at the Technical College at Vienna. The works were opened November, 1909, and were now in full swing. The Association had contributed to the establishment of the works, and had promised to find for the first three years the remuneration of 800 kronen per annum for an assistant. The second departure was the establishment of a course of training for gas and water fitters, for which the Vienna Corporation had provided a suitable school. This course started on March 1 last. The "Zeitschrift" of the Association (from the last number of which this account of the proceedings at the general meeting is taken) was reported to be making excellent progress.

Herr O. Peischer, the Manager of the Innsbruck Gas-Works, next gave a description of the works, with particular reference to the installation of settings of horizontal carbonizing chambers, of which a description was given in the "JOURNAL" a short time ago (see Vol. CX., p. 231). Dr. R. Geipert, of Berlin, then gave an address, on "Retorts or Large Chambers," which was followed with great interest. It gave rise to a long and lively discussion, in which, among others, Herr Bössner, of Vienna, Herr Benninghoff, of Dortmund, Professor Strache, of Vienna, and Herr H. Koppers, of Essen, participated. A summary of Dr. Geipert's address will be given in the "JOURNAL" shortly, in so far as it contains matter not already dealt with in other papers by him recently published (see "JOURNAL," *ante*, pp. 167 and 169).

The proceedings on the 28th ult. opened with the election of Vice-Presidents and Members of the Council of the Association for the ensuing year; and it was decided that the next year's meeting should be held at Brünn. The following papers were then read: "Bauduins' Distance-Indicator of Gas-Pressure and Water-Level," by Herr F. Lux, of Ludwigshafen; "Novelties in Apparatus for the Utilization of Gas," by Herr Rödenbeck, of the firm of Friedrich Siemens, of Dresden and Vienna; "Gas-Meters," by Herr Wellard, of the Danubia Company, of Vienna; "Advances in High-Pressure Inverted Lighting," by Herr Max Scholz, of Berlin; "Gas Fires and Cookers as a Means of Increasing the Sale of Gas," by Herr G. Meurer, of Tetschen; and "Notable Advances in Gas Cooking and Heating, and a New Metal Coating in Place of Enamel for Cooking and Heating Apparatus," by Herr Schöne, of Harzgerode.

After these papers had been read, a resolution was passed deprecating the proposed imposition of a tax on light and gas in Austria; and instructions were given for copies of it to be forwarded to the Minister of Public Works and the Minister of Commerce. With a vote of thanks to the Chairman for his able conduct of the proceedings, the technical business of the meeting was brought to a conclusion.

MIDLAND JUNIOR GAS ASSOCIATION.

Visit to Malvern.

It was obvious, as one glanced at the programme, and saw the words "June 11—Visit to Malvern," that something which would be likely to combine pleasure with business had been arranged for the final fixture of the 1909-10 session of the Midland Junior Gas Engineering Association, and that the date had been chosen so as to offer the greatest prospect of securing the maximum of enjoyment. Unfortunately, on Saturday, owing to the mistiness of the atmosphere, the beauties of the district could not be fully realized; but whatever may have been the shortcomings of the meteorological conditions in this respect, there was certainly nothing wanting in the welcome which awaited the sixty or seventy members who joined in the outing. The Malvern Urban District Council not only gave permission for an inspection of the gas and electricity works, but they went further, and provided conveyances to take the visitors to the works, and subsequently for a drive. The Chairman (Mr. F. A. Moerschell) and members of the Gas and Electricity Committee, too, showed their interest in the Association by joining in the proceedings. Arriving at Malvern Link, a start was made with the first item on the programme—the inspection of the Malvern Link Gas-Works, over which (as well as afterwards over the electricity station) the members were conducted by the Engineer and Manager (Mr. J. W. Rendell Baker), who was assisted by Mr. Greenhalgh (the Assistant Electrical Engineer), Mr. A. Hancox (the Gas-Works Foreman), Mr. Houghton (the Gas Distribution Foreman), and other members of the staff.

Seeing the neat appearance of the gas-works and their attractive surroundings, one was tempted to envy Mr. Baker his lot. But even in Malvern there is something to contend against; and this "something" is a heavy capital account. To keep this down as far as may be, everything possible is done out of revenue; and, of course, in connection with all questions of extensions and improvements, "cost" is a most important consideration. It is gratifying to note, as showing that there is a determination to keep abreast of the times, that the whole of the streets are lighted by 1100 lamps, all of which are fitted with incandescent burners. There are some 63 miles of mains; and with a consumption last year of 133 million cubic feet, the unaccounted-for gas amounted to about 5 per cent. The improvement that has been secured in the latter respect by Mr. Baker (through the carrying out of extensive repairs), will be apparent when it is mentioned that five years ago the percentage of unaccounted-for gas was close upon 15.

To return to the inspection of the works, the visitors were first taken through the carpenters' shop, the smithy, and the engineering repair shop, and found them to be well fitted up, light and airy, and generally comfortable. The gas-works adjoin the Great Western Railway, and are equipped with sidings, which run into the coal-stores—there is, it may be remarked, storage room under cover for about 1800 tons. When the waggons arrive, they are, after passing over a weighbridge, end-tipped, by means of a belt-driven ram; and the coal is subsequently dealt with by breaking and elevating plant, which is in duplicate. The retort-house, which is 127 feet long and 52 feet wide, contains ten settings of eight retorts, each 20 feet long, set at an angle of 32°. The members were able to see one setting in course of renewal. There are four coal storage hoppers provided, each of an approximate capacity of 17 tons; and the charging arrangements are of the Shoubridge type. The coke from the retorts is discharged through an opening in the floor into tip-waggons, and quenched outside the house. The statutory power at Malvern is 16 candles; but Mr. Baker makes 17½-candle gas. Using North Wales, North Staffordshire, and South Yorkshire coal, he gets a production of 11,600 cubic feet per ton.

Of the usefulness of retort-house governors, Mr. Baker seems firmly convinced; and he has two of the Braddock type installed, through which the gas passes along the foul main to the annular condensers, and to a Livesey washer and a Clapham scrubber. The exhauster-house contains four of Waller's exhausters, two of which are used (with Bryan-Donkin diaphragm governors) in connection with a high-pressure plant which aroused a considerable amount of interest among the members. The storage depôt for Great Malvern is situated at the electricity station, which is a considerable distance from the gas-works; but the only storage capacity for gas for the Malvern Link area is a 20,000 cubic feet single-lift holder at the gas-works. It being found impossible with this small holder to cope satisfactorily with the demands for gas, the plant referred to was installed last winter as a form of booster to give pressure on the Malvern Link district. These two exhausters were formerly employed solely for pumping gas through the trunk main to the storage station for Great Malvern; and connections are taken off to feed the holders at the electricity works as hitherto. Thus, instead of a pressure of perhaps 11-10ths when Sunday cooking operations are going on, it is possible to give the Malvern Link consumers from 28 to 30 10ths; and since this arrangement has been in operation, not a single complaint of ineffective cookers has been received. In fact, in many directions, Mr. Baker is able to show that he has done good work during his period of engineership at Malvern; and no doubt he will do more.

Among the other plant to which attention was drawn, there were two Lancashire boilers fitted with Wilton furnaces, feed-water heater, and boiler feed-pumps, and apparatus capable of manufacturing a ton of sulphate of ammonia per day. Trouble was at one time experienced with regard to the effluent from the sulphate-making operations; but Mr. Baker recently installed a purification process which has thoroughly effectively solved this problem. There are eight purifiers—two 17 feet by 19 ft. 6 in., two 13 feet by 17 feet, and four 9 feet by 17 feet—but plans and specifications are in hand for increasing the size of these units to deal with the present make of gas. Mr. Baker was able to show his visitors a quantity of Lux purifying material, which he is now using mixed with coke-dust, and which he intends to try also with sawdust. The station meter is of the Parkinson and Cowan type, of a capacity of 60,000 cubic feet per hour.

The party having lingered at the gas-works as long as time would allow, and having been photographed at the entrance to the station-meter house, the drive was resumed to the electricity works. This branch of municipal enterprise has been in operation for some six years; and the installation is now self-supporting, while at the same time the sale of gas has not decreased. As already stated, the gas for the supply of Great Malvern is stored at the electricity works; there being for this purpose three gas-holders—one, of 500,000 cubic feet capacity, rope-guided, and two smaller ones, of 74,000 feet and 149,000 feet capacity respectively. Two water-loading governors are provided for this district—one a Parkinson and Cowan, and the other a Braddock. The Gas Department is still further represented at the electricity station by stores and a cooker cleaning and repairing shop.

As to the electrical plant, the boiler-house contains two Lancashire boilers, fitted with Wilton furnaces, which are used for the destruction of approximately 3500 tons of refuse per annum, and provide a portion of the steam for the generation of electricity. There are also a feed-water heater and boiler feed-pumps. The engine-room contains two 100 K.W. and one 50 K.W. alternators, generating electricity at 2000 volts, which is discharged through a high-tension Ferranti board to the various sub-stations in the Malverns, where it is transformed down to 100 volts. The equivalent of 16,500, 30-watt lamps are now connected.

The inspection completed, the conveyances were once more requisitioned, and the visitors were driven to the Imperial Hotel, where they were entertained at tea by Mr. Moerschell.

The PRESIDENT (Mr. A. O. Jones) proposed a hearty vote of thanks to the members of the Malvern Urban District Council, and particularly to the Chairman and members of the Gas and Electricity Committee, who had taken such a great deal of trouble to make the visit an interesting and enjoyable one to them all. Mr. Moerschell had presided over the Gas Committee for a series of years, with credit to himself and the Committee; and the Association heartily thanked him personally for the hospitality extended to them, and the Committee generally for the good time they had given them.

Mr. R. J. ROGERS (Birmingham) seconded the motion, and remarked that the members of the Association owed a great deal to such public-spirited gentlemen as Mr. Moerschell and the members of the Committee, for their hearty invitation to Malvern and the pains they had taken to make the visit so instructive and enjoyable. A great deal had been said recently as to the dual control of gas and electricity undertakings; and the matter was receiving the attention of some concerns having such joint control at the present time. But from what the members had seen that afternoon, he was sure they would all agree with him that the Malvern undertaking in its combined form was a very satisfactory one, and redounded to the credit of all concerned—to the Chairman of the Committee, and the Engineer and his staff.

The vote having been carried by acclamation.

Mr. MOERSCHELL responded. He said that when Mr. Baker, to whom they were indebted that afternoon more than to any member of the Council, brought the proposal before the Committee, it was agreed to with great pleasure, and had the unanimous support of the Council. In fact, they felt very pleased that Malvern was to be visited by an Association of members of what was to them so distinguished a profession, to whom they were indebted for the great privilege of having light when they most needed it. If the members carried away pleasant recollections of the afternoon's visit, the Council would feel amply repaid for any little trouble that had been necessary.

Mr. JAMES HEWETT (Saltley) proposed a vote of thanks to Mr. Baker, to whom the success of the visit was so largely due.

Mr. W. H. JOHNS (Saltley), in seconding, remarked upon the order and cleanliness of the works.

The vote was heartily accorded.

Mr. BAKER, in response, stated that he felt that any efforts of his would have been useless but for the spontaneous and whole-hearted willingness evinced by his Council when the proposed visit was brought before them. As regarded himself, it was always a pleasure to him to do anything for the Midland Junior Association, for he felt that he was doing something for those who were helping themselves. This was evidenced by the splendid papers which had been read at their meetings; and he was sure anything that any member of the Institution of Gas Engineers could do for such an Association of Juniors, would be done with great pleasure. He extended to them individually a very hearty invitation to visit the works again any time they were in the neighbourhood of Malvern.

The members then again mounted the coaches, and were conveyed by the lovely road round the Malvern Hills. Though a slight fall of rain was met with, it did not succeed in marring the enjoyment of the ride.

WAVERLEY ASSOCIATION OF GAS MANAGERS.

Annual Meeting in Edinburgh.

The Ninety-Fourth Meeting of the Waverley Association of Gas Managers was held in the Cathedral Hotel, Edinburgh, last Friday—Mr. H. RUTHERFORD, of Aberlady, the President, in the chair.

The PRESIDENT extended a hearty welcome to the members, and returned thanks for the honour which had been conferred upon him by electing him President for the year. This was the second time he had held the office; the previous occasion being fifteen years ago, when Mr. Herring was present, and they gave him a very warm welcome. They were all very sorry he was about to leave them, because he had taken such an interest in their little Association. They hoped he might be spared for a long time to come, and have every success and prosperity in his new sphere of life. He (Mr. Rutherford) had been a member of the Association for thirty-two years, and he did not think that he had been absent on a single occasion. He hoped the members would find the meeting one of great usefulness. When he accepted the position of President a year ago, he intimated that he would not give an address, but they were to have a discussion which he hoped would prove beneficial to all.

OXIDE PURIFICATION.

The PRESIDENT then introduced Mr. R. W. COWIE, of Dalkeith, who, he said, was to open a discussion on oxide purification. He was sure they would all give Mr. Cowie a hearty welcome, especially as this was the first time he had been present at a meeting of the Association.

Mr. COWIE thought that the Committee of the Association had made a good choice when they selected oxide purification as the subject to be dealt with at the meeting, as it was one which every gas manager, no matter how small his works might be, could discuss with interest. He considered, however, the President had not been so fortunate in his choice when he selected him to open the discussion, as his experience of the particular method of purification referred to was very limited—he having adopted it only some nine or ten months ago. He was therefore unable to give any glowing accounts of boxes running for very long periods without being emptied and refilled; but no doubt some present would be able to furnish much really interesting information. His short experience, however, confirmed most of what he had heard in favour of oxide in preference to lime; and he would never think of returning to the use of the latter material. Should any member present be contemplating making the change, he could assure him that it would pay him to do so. The purifiers at Dalkeith were rather small; and in winter, when using lime, it was almost a constant job to empty and refill them. They were four in number, and were worked three on and one off, by means of a dry-faced centre-valve. When starting to use oxide, he did not wish to make the change too suddenly, in case he might experience what he had heard had troubled some managers—viz., the oxide failing to catch; in other words, passing foul gas while it was clean itself. As each lime box became fouled and out of action, he refilled it with lime and oxide—placing the lime in the bottom layer and the oxide on the top. Thus the boxes were filled with lime and oxide; and if the oxide failed the first time it was exposed to foul gas, the lime did the work. As each box again became fouled, he filled it with oxide only, using that which had been fouled and revivified along with fresh oxide. This, again, was done with each box till all were filled with oxide only. The method described had effectually prevented the oxide passing foul gas. In his case, the gas entered the purifiers at the top, and passed down through the purifying material. He considered this to be a better way of working than passing the gas up through the mass. The moisture formed by the chemical action in the purifier was thus deposited on the top of the oxide and kept it moist; whereas if it were to form or be deposited on the oxide between the spars of the grids, there was greater liability to choke them, and to cause back-pressure. It was not until he had all his boxes filled with oxide that he started to introduce a small percentage of air. At first he used the high pressure of gas at the outlet of the exhauster as an injector for putting in the air at the inlet to the condensers; but this proved too erratic and uncertain. He discarded the method, and then used a steam jet to draw in the air through a wet meter, fitted with a copper drum, and with a dial showing the hourly rate of flow by one-minute observations. This meter was fitted with a back-pressure valve on the outlet, which prevented any chance of the crude gas from the condensers getting back to the meter should the steam be shut off and any back-pressure occur. This method of introducing the air was a very good one, and was reliable where steam was to be obtained. The only objection he had to it was that the condensed steam diluted the liquor too much, especially in summer, when the make of gas was low. He had just introduced a small rotary blower, driven from the exhauster pulley; and he considered this was really the best method of sending in the air. He introduced it to the gas at the condensers, and had to do so because of the steam. But with the blower it might be introduced to the purifiers direct. He should much like to hear what any of the members who had had larger experience had to say on the point. He put in about 3 per cent. of air; and his boxes were doing splendidly. All the members present were doubtless aware that with oxide and no lime the carbonic acid was left in the gas, causing consequent reduction in illuminating power. This need scarcely trouble anyone nowadays, when the standard was becoming lower, and when most of the members used coals from the Lothians, which were more or less of a good gas-making quality. After working continuously for seven months, the air-meter did not operate quite satisfactorily; and on having it opened for examination he was very much surprised to see the state it was in. On the sides of it were sticking blocks of a soft, red substance, and on removing these he was surprised to see the metal quite pitted. This was probably caused by the fresh air being continually drawn through the water, and coming into contact with the wet surface of the inside of the meter, and thus rapidly corroding or oxydizing it. He had since had the meter filled with oil instead of water, and he had no doubt that its life would be very much longer, and that it would not require the frequent adjustment of the level, as the oil would not dry up. Shortly after changing from lime to oxide, he had a large number of complaints of dry and stiff joints and cocks in the consumers' fittings and cookers. Whether there was a more discontented spirit abroad, or whether the change in the method of purification had any connection with it, he did not know. There were a number of advantages which undoubtedly followed the use of oxide. In the first place, the cost of the material to purify a fixed quantity of gas was less than with lime. The labour was also much less, especially when a percentage of air was admitted to the purifiers. There was less wear and tear of the purifier grids, owing to much less frequent changing of material; and also a saving of gas, for the same reason. Moreover, purification could be effected without causing the bad smells inseparable from the use of lime; and there was less labour. The question of revivifying the foul oxide was one he had not touched upon; but it was one of great importance, and he trusted it would not be lost sight of in the discussion. Where the works were not well exposed to the winds, and in the open, he did not think it advisable to hasten revivification by the forceful admission of air and steam, because of the very objectionable smell caused thereby. There ought always to be a sufficient quantity of oxide in stock, ready to take the place of the foul material, and so give it plenty of time to recover by turning and watering. If the oxide were laid out in furrows, a greater surface would be exposed to the air.

Mr. A. ROSS (Burntisland) explained that he had used oxide of iron for the last four years, and his boxes were 10 feet square. Before changing, they passed 2½ million cubic feet of gas through them. The cost for oxide was about £10 a year. They passed 22 million cubic feet of gas, and used no lime. At one time he sent in air through the purifiers; but he had taken off the air-meter altogether, and found it very satisfactory. In former years they paid more than £100 for lime.

Mr. P. BLAIR (Haddington) said when he originally started oxide purification he, like others, kept lime in reserve. First of all he had one sieve of lime and the other of oxide; but in a short time he gave this up. He had four purifiers, with a dry-faced centre-valve. He wanted to have a catch purifier, and he cut off one, and connected it up with a bye-pass for gas. He worked the three other purifiers in rotation—two on and one off; but he could work all of the purifiers. At the outset, he used the check purifier with lime. But after a time he found this material did very little good after the first fortnight; and as the oxide accumulated he filled up with oxide. As regarded the temperature of the purifiers, he took the exhaust steam from the exhauster, and put a 2-inch pipe three times round the bottom of the purifiers, so that the temperature was about 75° Fahr. He changed the purifiers twice a year—in the spring and in November. He was not troubled either with back-pressure or with moisture in the purifiers. All the moisture he used to get in the bottom of the purifiers was now carried off to a syphon between them and the holders. He used air, and had to reverse the valve—in winter every day, and in summer twice a week. The material was hard, and required a pick to get it out; and it had to be broken.

Mr. W. YOUNG (Penicuik) said he thought he was the pioneer of oxide purification in Midlothian, for he commenced about seven years ago. He was asked to try it. In their little gas-works it cost, when he went there, £43 a year for lime. There were four purifiers 10 ft. by 10 ft. by 4 ft., capable of dealing with three times as much gas as they made. This gave him a very great advantage. He filled three of them with oxide, and one with lime; and it was a wonderful revelation to him. In three years it cost them about £10 to purify their make of 9 or 10 millions. Till last year he was ree from any disturbance in purification; but in January he had occasion to empty two of the boxes and put in new oxide. All went well for a fortnight, and then it struck off. He could not understand this. He sought advice, and he was told to clear out the two new purifiers, and put in some dirty stuff. He did so, and it went all right. He put in about 2½ per cent. of air, and found it acted excellently.

Mr. J. B. SCOTT (Cowdenbeath) said he had been purifying by

oxide for nine years. He had not experimented very much with it, having been quite content to get the best results in the usual way. The purifiers were small for the make of gas they now had. So long as the purifiers were of ample size for the make, they ran them sometimes eight or ten months, and never had a test-paper on the gas. The purifiers were getting too small, and he had to rush the gas through them, which meant that the oxide had not a chance of doing its work; and he had to be very careful, as otherwise they would find sulphuretted hydrogen. If they wanted oxide to be a great success, they must have ample purification accommodation; and then they must have a large stock of oxide. There must be ground enough for revivifying, and plenty of space in the boxes. There was no comparison between lime and oxide. Mr. Ross said he passed 2 million cubic feet of gas per box before changing, without air.

Mr. Ross explained that he used air for a year or two, but did away with it.

Mr. Scott said he introduced about 3 per cent. of air. The make of gas varied so much that they could scarcely expect men to regulate the injector to a nicety; but with about 3 per cent. he found no fault with it. He introduced it with an air injector. He did not think it mattered very much where the air was introduced; in fact, he had found it to be a good thing to have an air-pipe laid to each box, so that they could divert the air into any box they wished. His purifiers were 12 feet square. He had only three; and he had to work them two on and one off. They were 3 feet deep; so that his purifying space was limited for a 32 million make. Last year he was passing about 1½ million feet of gas through each box. This year he was proposing to put down new purifiers; and he might mention that he was going to put them down large enough. The cost of purification with oxide, for the last eight or ten years, had been about 0·20d. to 0·35d. per 1000 cubic feet. They could only get the cost down to this figure by using oxide; and with this material they got rid of the dust and the heaps of rubbish lying about which they had with lime.

Mr. W. Blair (Helensburgh) said that about six years ago he started purification by oxide of iron, not altogether for economical reasons, but to reduce the nuisance caused when they were changing boxes, when using lime. He went in partly for lime and partly for oxide; but lately he had used oxide entirely. During the last five years, it had cost them, for purifying 289 million cubic feet of gas, £256. This worked out at 0·21d. per 1000 cubic feet. During the past year he had paid practically nothing for material. He had paid £8 for labour; but he had received £3 15s. for spent oxide, which brought down the cost of purifying 60 million cubic feet of gas to £5 13s. 4d., or 0·02d. per 1000 cubic feet. Purification used to cost them barely 1d. per 1000 cubic feet—material and labour. He introduced air. He first tried it at the hydraulic main, but afterwards brought it back to the inlet of the condenser, which was much handier, and avoided moisture settling in the pipe. There had been no difficulty with the meter during the six years he had had it. He was subject to a little back-pressure on the lower trays of the oxide. There were four boxes, 12 feet square, with centre-valve, working in direct rotation. He could work with one, two, or three on. The air introduced varied from 1½ to 2½ per cent.; but, it was practically *nil* at this time of the year. To give a greater run without having to change the boxes, he introduced to the lower tier what he called bye-pass valves. He had only changed his boxes once during the past year. He did not require to do it, but he was anxious to see the inside of them. There was no doubt that those who had had experience with oxide purification would never think of going back to lime. Apart from economy, they got rid of the nuisance they always had when changing a purifier box, which was one of the most disagreeable jobs a gas manager had. He would advise those who had not given oxide a trial to do so. It was true that the illuminating power of the gas was slightly reduced; but he enriched his gas 2½ or 3 candles by benzol, and he did not take this into account.

Mr. W. Brown (Cardenden) said he had only just begun purification by means of oxide, and he had three purifiers filled entirely with this material. There was no air-blower as yet; but he had purchased one. Up till now he had passed about 3 million feet of gas through his purifiers. From his experience with lime, he would never think of going back to it.

Mr. H. O'Connor, F.R.S.E. (Edinburgh), said perhaps he had had a longer experience with purification by oxide than anyone present, as it was more than thirty years since he first used this material. They always had two or more boxes with oxide, as well as lime purification. That was in London, where the gas had to be purified from bisulphide of carbon, and other sulphur compounds, as well as from sulphuretted hydrogen. The principal difficulty in the use of oxide had always been that it would not remove carbonic acid; and so long as the candle power of the gas was what it was required to be, this was a very important matter, especially in Scotland, because the Scotch coal contained a larger percentage of carbonic acid than the Newcastle and Durham coal used in the South. The difficulty had, however, now largely passed away, because they no longer wanted so much illuminating power in gas. Lowering by 5 per cent. meant a reduction of 1 per cent. of carbonic acid; and the calorific value of the gas would probably only be reduced to this extent. It was calorific value they wanted nowadays; so he thought the use of oxide would extend considerably in future, and, in his opinion, very wisely, especially where the oxide was treated with an addition of air, because then they would not only get rid of all the smells they had with the lime, but also what little odour there was with the oxide itself. If they did not use air with oxide, they would have a certain amount of smell from the foul oxide when it was laid out; but if they used air, this smell would be done away with. There were two ways of getting oxide to start rapidly; one being to mix a little old material with the new. Another plan was to water the oxide, when it was first mixed, with weak ammoniacal liquor. This would make it start to work immediately. Another point which was of great advantage was the thorough washing of the gas before it went to the purifier. In some works the washing of the gas had been increased considerably. In one case which he had in his mind, he thought the quantity of ammoniacal liquor and tar amounted to 70 gallons per ton of coal. This was pretty high; and there was no question about it that this 70 gallons of tar and liquor contained a large percentage of sulphuretted hydrogen and carbon dioxide, which would otherwise be passing on to the purifiers, and have to be dealt with by them. There was no doubt that, for oxide purification, it was much better to have the purifiers of large size. If they had to use purifiers which were too small for the make, it was well to adopt some of the patent systems of grids, so as to enable them practically to fill the purifier with oxide, and yet obviate any great increase in their back-pressure. This would sometimes allow for double the quantity of gas passing through a purifier of a certain size. The trouble with the air-meter which contained a large amount of rust or deposit upon it might have been completely overcome if the air had been drawn primarily through a small water-seal, and then the seal-pot from time to time cleaned out, and care taken that no dirt, or probably oxide of iron, which might be flying about in the air, especially during warm weather, should get into the meter. The question of the temperature of the purifier was a most important one. He had in his mind a case in which he was called in to advise as to the purifiers, which had suddenly stopped. When he arrived at the works, he found that the purifiers, though they had a roof over them, were open on all sides to the weather, and that snow had blown in on to the top of the purifiers, and was lying some 6 or 8 inches thick. He immediately said: "There is the reason at once. The material has become so cold that purification is not taking place at all." He advised that steam-pipes should be used to get the purifier warmed, and that a partition should be put up a certain height, so as to prevent the blowing-in of the snow. He believed this completely removed the trouble. When lime and oxide were used together, they should certainly never be put in the same box, because the foul lime gradually got mixed with the oxide, which made less oxide for purifying purposes, and rendered it useless for selling. They should therefore keep oxide and lime quite separate. If they ever wanted to use the two, let the gas pass through the oxide first, and then through the lime. The reason for this was that the valuable part of the foul oxide, to the people who purchased it, was its content of cyanogen. If the gas first passed through lime, a very large proportion of the cyanogen would be deposited in the purifiers, and would be thrown away with the foul lime. If they passed the gas through the oxide first, the oxide would retain the cyanides, and they could then be recovered.

Mr. D. Vass (Airdrie) gave a brief description of what he did from the beginning. He said they were hampered very much in getting rid of their lime; and this was what put them on to oxide of iron. He had had experience with oxide in Greenock years before. He began by putting in a tray of oxide and then a tray of lime; but it was not long before he decided to work with oxide alone. He then fitted up a blower to every box. There was in his mind the danger of firing in connection with the blowing-in of air, drawing the plugs, and letting it go through. He was puzzling as to how to get rid of this danger when he observed a remark, made in connection with another works, that in the presence of foul gas and a mixture of air there was little or no revivification, but that in the presence of a pure gas and air a certain chemical action took place; and that in the works in question they had been working in that way—putting the gas into one box, then through the second box, and then sending it away. Then they reversed the action, and put the gas into the second box first, and back through the one which had been fouled. In this way they found that the second box, which was comparatively clean, took up all the impurity, and that the box which had been already fouled got purified. He began to consider how he might apply this, and he discovered that the best way of doing it was to put the second purifier on first instead of last. This was the principle of what they called the backward way of working. It was not a reversing of the blow, as was done in the other works; it was a reversing of the way of turning the valves. He wished to make this point clear, because many had an erroneous notion of it. The gas travelled in the same direction; but they reversed the turning of the centre valve. The theory of the method of purifying was that air which was not able to do its work in the first box because of the presence of an impurity, did it in the second box, when the impurity had been removed; and so they were given a clean box without the labour of having to open it. It would work with four three, or even with two boxes. His own idea would be to have three oxide purifiers of fairly good size, then two lime boxes, about the same size, by which he would catch carbonic acid gas, and then other two, of smaller size, with oxide, because when they passed gas through oxide and then into lime there were certain sulphur compounds which were broken up in the lime, and were not always captured before they left the lime box, but which would be caught in the oxide box. His idea would be seven boxes, two

of which would be catch boxes of lime and two of oxide. He had occasionally had difficulty in getting the material to catch, owing partly, no doubt, to its becoming cold; and for this reason he recently introduced a system of steam-pipes. He blew steam into the boxes; but great condensation took place, and now his arrangement was to put a steam-coil through the boxes, so as to bring up the temperature to from 55° Fahr. to 70° Fahr. He seldom had any difficulty with the material not catching. Perhaps at the beginning of winter, when the steam was not on, they might have trouble. He had found it was a good plan to bye-pass a portion of the scrubbing plant for a short time, In this way they got the ammonia into the purifiers; and this would catch all the sulphuretted hydrogen until the material began to act. He had found that by doing this he could bring back the boxes into action within 24 hours. Perhaps a little ammonia getting forward had been the trouble with the stopped cocks at Dalkeith; though he did not say it was. It might interest some of the members to know that in a few works they got very good results from using air with lime, pretty much in the same way as they were doing with oxide of iron; but the lime purifiers must be ample. A reaction took place, but only when the boxes were greatly in excess of the requirements of the works. His costs for labour were simply the expense of renewing four boxes twice a year. He could run longer, and he did so on one occasion; but he would not advise anybody to go more than half-a-year. When a box was opened, the material was found to be as hard as a briquette; but there was no difficulty with back-pressure. It was said that there was a danger of adding to the bulk of the material in the boxes by converting it into free sulphur, which would not rise freely enough, as it increased in bulk, and that an expansion took place, which, in large works, affected the side sheets of the purifiers. This might account for some things; and he would therefore advise everyone to open his purifier boxes at least twice a year. His working costs had been something like ½d. per 1000 cubic feet over a number of years; and he thought they would find that in most of the works where oxide was used the cost was from ¾d. downwards, while in those where lime was employed his experience was that the cost was about 2d. per 1000 cubic feet. Mr. O'Connor said that the value of spent oxide was very much based on its content of cyanides; but in Scotland they had not a market for oxide on this account—they were dependent very much on the sulphur. He approved of what Mr. O'Connor had said as to using oxide first and lime afterwards. He also employed oxide alone.

The PRESIDENT proposed a vote of thanks to Mr. Cowie, and to the gentlemen who had taken part in the discussion.

Mr. COWIE said he was very pleased indeed that there had been so excellent a discussion. He must acknowledge that he had benefited by the experience of others. He had been thinking of what Mr. O'Connor had said about lime getting mixed with oxide; but if the oxide were put on the top, there would be no danger of mixing.

PROPOSED BENEVOLENT FUND.

The HON. SECRETARY (Mr. W. Young, of Penicuik) submitted a proposal by a member of the Council for the formation of a Benevolent Fund in connection with the Association; the suggestion being that 6d. of the members' subscriptions should be applied to the fund, and that any surpluses which might arise in connection with the general fund, as well as donations, should be added to it.

Mr. VASS moved that the subject be referred to the Committee to prepare a scheme; and this was agreed to.

ELECTION OF OFFICE-BEARERS.

The following were elected office-bearers for the year:—

President.—Mr. R. W. Cowie, of Dalkeith.
Committee.—Messrs. James Gemmell, of Melrose, J. M'Laren, of Duns, and J. Hamilton, of Tranent.
Hon. Secretary.—Mr. W. Young, of Penicuik.
Auditor.—Mr. J. O'Halloran, of Edinburgh.

PRESENTATION TO THE PRESIDENT.

Mr. J. M'Laren presented to the President a gold-mounted silk umbrella, bearing an inscription; it being explained that the presentation was in lieu of the President's Medal, which Mr. Rutherford already had.

THE DINNER.

After the meeting, the members and friends dined together—Mr. Cowie in the chair. The toast of "The Waverley Association" was proposed by Mr. A. H. Hamilton, of Glasgow, and acknowledged by the President.

Subsequently a pleasant afternoon was spent by the company in the Marine Gardens at Portobello.

Mr. Balfour Browne on "State and Municipal Trading."—In the "JOURNAL" for the 26th of April last, we gave an abstract of a lecture delivered by Mr. J. H. Balfour Browne, K.C., before the British Constitution Association, on "State and Municipal Trading and Where it Leads." The lecture has now been published, with notes and in a wrapper, by the Anti-Socialist Union, of Nos. 58 and 60, Victoria Street, Westminster, S.W., at the price of 1d.

FUEL CALORIMETRY.

At the Meeting of the London Section of the Society of Chemical Industry, held at Burlington House on Monday last week, under the chairmanship of Dr. J. Lewkowitsch, Mr. G. NEVILL HUNTLY, B.Sc., F.I.C., read a paper on the "Accuracy Obtainable in Fuel Calorimetry." Mr. Huntly is one of the staff of Gas Examiners of the London County Council, and as such has had experience with the Boys calorimeter for determining the calorific value of gas. But his paper on this occasion dealt almost entirely with the determination of the calorific power of coal and other solid fuels in the bomb calorimeter of the Berthelot-Mahler type.

The author stated that the limit of accuracy of work with the bomb calorimeter using a mercury thermometer was about 2 parts in 1000; but rather a greater degree of accuracy was attainable if an electrical resistance thermometer was used. The Beckmann type of mercury thermometer, which has a scale divided into one-hundredth of a degree, and the range of which is limited to 5° or 6° C., cannot, according to Mr. Huntly, be read more accurately than to one-tenth of a division, or one-thousandth of a degree Centigrade. But so far as fuel calorimetry is concerned, he considers this degree of accuracy fictitious, because the terminal points of the limited scale are set according to a thermometer which is graduated in tenths of a degree; and the readings of the Beckmann thermometer consequently are dependent on the accurate calibration of the thermometer with the less open scale against which it has been set. Hence there is no real advantage in bomb calorimetry in using the Beckmann type of thermometer in place of a good thermometer graduated in tenths of a degree.

The merits of the French, German, and English makes of thermometer were discussed by the author, who pointed out the difficulty of reading thermometers with an enamelled background when the top of the column of mercury happened to coincide with one of the lines of the scale. The finest lines are used on French thermometers; and these have a width of 0·2 mm. Since 1 mm. represents approximately one-tenth degree, it will be seen that when the top of the mercury column coincides with one of the lines on the scale, it is impossible to read exactly, unless the thermometer has a clear-glass background, and can be turned round so that the reading may be made with the scale at the back.

The author proceeded to discuss the corrections which were required in a thermometer to ensure absolute accuracy; and he enumerated the following seven corrections which were necessary in precise thermometry: (1) Calibration; (2) for external pressure; (3) for internal pressure; (4) for change of zero; (5) for the value of a degree; (6) the stem correction; (7) for reduction to the hydrogen scale. Of these, calibration was the most important. The certificates given for thermometers by the Reichsanstalt gave the calibration corrections; but those issued by the National Physical Laboratory did not give the calibration corrections but merely the general correction deduced from the results of comparison with a standard thermometer. The limit of accuracy in a mercury thermometer, in practice, was about 1 in 1000.

The most important point in bomb calorimetry was the determination of the water equivalent of the instrument. This was usually done by the makers; and engineers and others adopted the figure so given without any idea of the limits of accuracy of the methods employed for determining the figure. There were three methods, of which that of burning a given quantity of a substance of known calorific power—such as naphthalene, benzoic acid, or sugar—was the most common. But the determinations of the calorific power of (*e.g.*) naphthalene made by Berthelot and other observers with extreme care differed by 1 to 3 parts in 1000; and consequently that represented the extreme limit of accuracy of the determination by this method of the water equivalent of the calorimeter. The more accurate method was that of putting a known quantity of heat into the calorimeter by an electric current, which was accurately measured. Other sources of error in bomb calorimetry were due to the assumption that the specific heat of water was constant, which is, of course, not the case, and to radiation and evaporation. Regnault's formula for the radiation correction was the basis of those generally used.

In conclusion, however, Mr. Huntly pointed out that the real difficulty in obtaining useful results in fuel calorimetry was the difficulty of sampling fairly a material such as coal. With the methods of hand sampling generally followed, however carefully they were carried out, two samples would not agree more closely than ± 0·5 per cent. in respect of the determinations of either ash, moisture, or calorific power. With the sampling machines which were in use in the United States (and in which a very large quantity of coal was crushed), the results on two samples would agree more closely. The error due to sampling was in any case as great as, or greater than, the possible errors of calorimetry if the calorimetric determinations were made with proper care. It was, however, in any case futile to return the results of determinations of the calorific power of fuel to the fourth figure, as the differences in consecutive determinations made with care frequently affected the third figure.

Dr. Brame, at the invitation of the Chairman, spoke a few words, in which he expressed his appreciation of the value of Mr. Huntly's paper, and emphasized the importance of the accurate sampling of coal and other fuel.

ASSOCIATION OF WATER ENGINEERS.

Abridgments of Papers and Discussions.

Continuing our report of the Meeting of the Association, we to-day extract the following from the papers and discussions.

RESERVOIR OUTLETS TO EARTHEN EMBANKMENTS.

By George N. Yourdi, M.Inst.C.E.

Embankment-making in Great Britain is, practically speaking, a matter of yesterday; and perhaps it would not be wide of the mark to say that the failure of the Dale Dyke Embankment in 1864 earmarks the date when the attention of water engineers was turned to the study of reservoir construction, and a revolution was made in the mode of providing proper, safe, and durable outlet arrangements to regulate and control stored waters. Practically up to the time of the failure of the Dale Dyke Embankment, the general practice was either to lay a line of naked pipes surrounded with puddle, or to construct a masonry culvert through or under the embankment. The outlet arrangements of the Dale Dyke reservoir consisted of two lines of 18-inch diameter spigot and socket cast-iron pipes, laid in a trench, and surrounded with puddle; each pipe line being controlled by a valve at the outer end. The trench to which the pipes were laid was under and through the embankment. The cause of the failure at Dale Dyke has never been satisfactorily explained, on account of the divergence of opinion expressed by the experts who were called in; and, like a good many other similar problems, it has been left unsolved.

Nothing can very well be worse than naked pipes laid through or under the made embankment, resting on, and surrounded by, a mass of plastic clay puddle, subjected, as this would be, to the unequal pressure due to the weight of the embankment. The pipes can never remain as originally laid; but sooner or later some of the joints must get drawn or a pipe or pipes become fractured, with the result that the water will have full play, and must very quickly effect the destruction of the works.

The obvious danger of the practice of laying naked pipes prepared the way for constructing a masonry culvert built in a trench under the made embankment; and at the point where the culvert crosses the puddle trench, a masonry or concrete pillar is brought up from the bottom of the puddle trench, with a view of giving it support, and preventing it yielding to the pressure brought to bear on it. The effect of this was, unfortunately, the breaking of the back of the culvert, owing to the unequal pressure and weight of the embankment on either side of the pillar acting on the ground supporting the culvert. To get over the difficulty, the slip-joint method was introduced. This consists of building the culvert in a series of lengths; each length being independent of the one against which it abuts as regards vertical bonding. In this way the rigid culvert was made articulated, and capable of responding to any tendency to settlement. On paper, this mode of allowing the culvert to accommodate itself to any tendency it may have to settlement, should work satisfactorily; indeed, it has been successfully carried out in a number of cases. There are, however, instances where it has proved a dire failure. The weakness of the "slip-joint" method lies in the fact that the settlement must be uniform, and the range of vertical movement small; otherwise jamming will take place with a crushing of the abutting faces, which will probably be accompanied by fracture. It is not, therefore, an arrangement to be recommended.

The doubtful practice of providing an outlet for the stored waters by means of a culvert of any kind through or under the embankment, and the numerous failures that have occurred with these methods, have induced many engineers to adopt an outlet arrangement consisting of a tunnel driven through and in the solid rock, passing round one end, and entirely disconnected from the embankment. The tunnel can either be made of a size to deal with flood water during construction and after, in which case there would be no need for a waste watercourse, or of a size just sufficient to permit of accessibility to the permanent draw-off pipes as well as for periodical examination of the work. The tunnel can be lined with cast-iron plates backed either with concrete or with a thin backing of cement grout injected pneumatically in the ordinary way, or it may be constructed of brick or ashlar, in all cases having projecting dividing walls provided at suitable points along its length to prevent the water from creeping on the outside.

It is extremely difficult to lay down any rules in regard to outlets, as they are the most difficult part of the work with which an engineer has to deal. It might, however, be laid down as an axiom that for high embankments a tunnel outlet is the only safe and reliable means of providing for the stored waters. For medium high embankments (say, not exceeding 40 feet), and provided solid rock that will not yield when subjected to the unequal pressure due to the weight of the embankment can be found at a reasonable depth, a culvert under it might safely be adopted. The trench must not, however, be at a great depth; and the rock must be not only homogeneous but massive, and not interbedded with shale or other soft strata, and, above all, must be continuous from one end to the other. For low embankments, when the depth does not exceed (say) 25 or 30 feet, a syphon carried over the top of the embankment or round one of the flanks may be adopted with advantage.

The outlet, whether tunnel or culvert, should be commanded by a tower, in which the valves or other arrangements for regulating the discharge of the stored waters should be fixed. The best position for this is at the mouth of the outlet; the valves being so arranged that they are accessible for repairs, and the tower be capable of coping with any and every eventuality. A watertight bulkhead or stopping is fixed at the base, which acts as a water-lock, and effectually safeguards against the flooding of the culvert should any accident occur to either the tower or the valves, and the supply, even if the tower were carried away, could be maintained without interruption. The tower permits of proper inspection, and the carrying out of repairs to the valves and fittings at all times, as by its means all are accessible. Should a pipe at any time become fractured in the tunnel, the supply can be cut off, and the necessary repairs carried out.

Regulating the discharge of stored waters by means of a valve-pit, built in the middle of the inner slope or close to the puddle wall, is a method that has been followed in the past; but, in the author's opinion, it should be avoided.

Another and a still more reprehensible method of controlling the discharge in culverts through embankments, is the introduction of a masonry, concrete, steel, or iron bulkhead in or about the centre of the culvert. The discharge-pipes lead off from this central stopping, and are governed by a valve or valves in the downstream side of the culvert. Here, again, the upstream end of the culvert is inaccessible, and in case of a burst pipe it would mean sending divers down to attempt to plug the inlet-end of the pipe. Should they fail in this, there would be no other course left but to empty the reservoir. Nothing can be worse than this mode of controlling the discharge; and the folly of such a design is too self-evident for further critical analysis.

Discussion.

Mr. R. H. Wyrill (Swansea) remarked that the paper was of extreme importance to water engineers. The embankments of reservoirs generally were more studied now than they were formerly; and such progress had been made that now a reasonable amount of security might be assured. There had in the past thirty years been considerable changes in method; but through all that time, wherever there had been a report of weakness in an embankment, it was usually found to be caused by the outlets. Regarding some of the points mentioned in the paper, the first was as to the advisability of carrying culverts through the embankment at all. Geology would have a great deal to do with this question. Supposing one had an embankment founded on solid rock, where a trench could be cut through the rock, there would be a chance of constructing a culvert there, because the strata would be weight-bearing. One would not be subjected to subsidences in the culvert; and there would be nothing to fear from the superincumbent weight. As to slip-joints, generally speaking they were not effective. The greatest security was to be obtained by passing round the end of the embankment, and making a tunnel. This presented no difficulties, and, as a rule, little more expense. The security had justified the expense in nearly all cases within his experience.

Mr. E. Sandeman (Derwent Valley Water-Works) thought the most interesting part of the paper was that referring to the Dale Dyke reservoir. There was no doubt that the failure of this reservoir had been the means of preventing the failure of many others. It taught engineers a lesson; and they had been more careful since. There was a curious point about the laying of the pipes in puddle. He quite agreed that in theory Mr. Yourdi was right—that it seemed a dangerous thing to do, and particularly in the way they were laid in the Dale Dyke reservoir. It was a most extraordinary way. But he remembered being told by Mr. Eaton, who was at one time Water Engineer to the Sheffield Corporation, that, when they took out the pipes from the Dale Dyke reservoir many years after the accident, they found the 18-inch pipes absolutely true and straight. It seemed to him contrary to theory; but it was a fact.

Mr. J. H. Taylor (Barnsley) said he was told that, at the request of Mr. Thomas Hawksley, a trolley was constructed, and a man went on it right through the line of pipes. Mr. Hawksley's opinion was that the failure was due to a land slip.

Mr. C. H. Priestley (Cardiff) remarked that the author stated that embankment making was practically "a thing of yesterday." Still, during the past seventy or eighty years some hundreds of embankments (the majority earthen ones) had been constructed, and very considerable experience had been gained. There had been comparatively few failures. He knew of only two instances where failure had been absolute—the Dale Dyke, and the Bilberry at Holmforth in 1852. Both were due to settlement. In the former case, the cause of settlement was never satisfactorily explained; and in the case of the latter, it was due to an escape of water in the embankment. The late Mr. Bateman said the pipes through the Dale Dyke reservoir were as true after the failure as they were in the beginning, though, of course, no engineer would now recommend the laying of pipes in the same manner. The author pointed out the danger of making a culvert through or under an embankment with a central pillar. Although possibly this was not good practice, they had near Cardiff a large reservoir constructed in 1887, having a culvert under the embankment with a central pillar, which had never shown the slightest sign of yielding to unequal pressure. Regarding the tunnel outlet, the method suggested as being of doubtful practice was one that had been carried out successfully by many of the leading engineers in the kingdom, and, in a large number of cases, had proved entirely

satisfactory. Although it might be desirable under certain conditions to take the tunnel through the solid rock and round one end of the embankment as suggested by the author, it did not follow that this should be the universal practice. In the case of a large reservoir he was now designing, such a method would, in addition to very considerable extra expense, introduce a further element of danger, owing to the size of the tunnel (16 feet diameter), and the difficulty of preventing the creep of water between the concrete backing and the excavation, which in this case had a periphery of about 87 feet. If the valve shaft and the tunnel on either side of the valve-shaft were built in the solid and unyielding measures, there could be little or no danger of the breaking of the back of the culvert, owing to unequal pressure. Concerning the point as to the valve-pit, the author stated that a considerable length of culvert on the upstream side was inaccessible when the water was in the reservoir. He could not see any reason why this should be accessible after the reservoir was in operation. The water pressure would be in equilibrium in this part of the culvert; and there would be no likelihood of any failing. On the point of central stopping, it was very unlikely that any burst would occur in the stop-piece, or the short length between that and the valves—in fact, the method recommended by the author was just as liable to failure as the practice he condemned. The author's statement that nothing could be worse than the method of controlling the discharge as described at the end of the paper, was of such a sweeping character that it condemned the general practice of a number of leading engineers in this country, and also threw doubt on the stability of many works that had been constructed during the last twenty years, none of which showed the slightest sign of failure.

Mr. Robert Askwith (Weardale and Consett Water Company) referred to an experience of his own. In the case of one of his reservoirs with a tunnel through the embankment, a shaft on the centre of the tunnel (in which a valve was now fixed) went out of the perpendicular. The shaft cracked inside; and it had to be made solid. The movement ceased at a certain time. The valve was put in; plugging was carried out to a good height; and there had been no further trouble. It was feared at one time when the reservoir was brought into use that the embankment would have to be taken down, and the shaft rebuilt. The embankment was designed in the days of the late Mr. Thomas Hawksley. He (Mr. Askwith) did not see any objection to water being on the inner side of the tunnel—that was, between the valve and the inlet to the tunnel—when the inlet was protected by a grating, because it would be an awkward thing if logs of wood were to get into the inlet and approach the valves, as this might prevent them being closed. The tunnel in the case of the reservoir referred to was constructed in the line of the stream in the centre of the embankment. Upon the tunnel was built a shaft. When the embankment was constructed, they could not get it to set absolutely evenly; and a greater weight went on to one side than on to the other, to the extent of 1 to 10 in about 70 feet height. Open cracks resulted, in which one could put his little finger. This was built in 1867-70, before Portland cement was much used. The tower was built in lias lime and brickwork; and that was very weak compared with Portland cement. As to the failure of the Dale Dyke reservoir, Mr. Hawksley told him it happened on a stormy night, and had nothing to do with the outlet-pipes. It was due to a slip of the hillside.

[Mr. Yourdi will communicate his reply to the discussion to the Association's "Transactions."]

EFFECT OF A SINKING HEAD ON LARGE CASTINGS.

By Thomas Kennedy.

Cast iron is not a pure metal; for in addition to pure iron it always contains considerable and variable quantities of silicon, sulphur, phosphorus, manganese and carbon chemically combined with iron, and carbon uncombined, existing as little shining plates of graphite in the mass of the iron, so that, on taking a wide average, there is only from about 90½ to 91½ per cent. of metallic iron in practically any cast iron. As cast iron comes molten from the cupola, it contains, in addition to the preceding list of impurities, more or less slag—the less the better.

Large pipes are as a rule specified to be cast on end, with the upper end prolonged to form a sinking head, which is afterwards cut off. The object of this paper is to show the advantages of this, and the desirability of it, in nearly all large castings—taking, as illustration, the results obtained in casting some large columns about 32 feet long, weighing about 12 tons, where a sinking head 2 ft. 10½ in. long, and weighing about 2 tons, was added. When this head was cut off, and broken under the ball, the fracture was very interesting. It showed that the head, which was much larger in area than the column proper, had been most efficiently feeding the column, as the molten metal in it was contracting in setting. It showed a good deal more than that. In the large pockets left by the receding, cooling metal, there were groups of crystals of pure iron. The crystals group together so that they all interlace one with another; the other ingredients combining with some of the iron, and forming a matrix which fills the interstices. The real strength of the casting is in these interlaced groups of crystals. In the body of such a casting, the crystals exist in identically the same form but much smaller, due to the quicker cooling, perfectly interlaced and homogeneous, owing to the great pressure above them of the slower-cooling sinking head.

The most deleterious impurities contained in cast iron, as it leaves the cupola, are slag globules, gases mechanically contained in the metal, and gases technically called "occluded" or absorbed physically in the metal, all or most of which will separate out as the metal passes from the liquid to the solid state. The excess of carbon in the metal separates into little plates of graphite as the metal solidifies; and there are also crystals of a very brittle substance known as phosphide of iron, and little areas of sulphide of manganese. All these substances are potentially in the metal as it leaves the cupola and goes into the ladle. As the metal is being poured into the mould, still more gases are formed by the action of the hot metal on the sand of the mould. The bulk of these escape through the cores and joints of the boxes in which the mould is formed, and when ignited burn with a non-luminous flame. Now the remainder of all the impurities mentioned—slag, gases, excessive graphite, &c.—are of a much less gravity than the proper metal; and if they have a free passage in the mould, they escape upwards to the top, but if not, they remain, and the result is a porous, weak casting.

When a long column, such as has been described, is cast on a sloping bank instead of vertically, crystals always begin forming at right angles to the cooling surface, with the result that millions of crystals form round the mould, and the passage of impurities is seriously impeded. If the column is cast horizontally, their escape is rendered impossible; and they remain in the top side of the casting.

In small, thin castings, the cooling is so rapid, and the gate is so near the body of the casting, that sinking heads are not necessary, as the air and gases escape readily, and the impurities have no time to segregate; but being spread more or less uniformly over the whole casting, their effect is so diminished as to be practically negligible.

Discussion.

The President (Mr. W. H. Humphreys) thanked Mr. Kennedy for his paper, which, he said, contained the results of a great many years' experience.

Mr. Alfred Towler (Ilkley) remarked that the paper was valuable from the scientific point of view. The author did not mention one of the practical reasons why pipes and columns of considerable length were cast vertically in preference to being cast at an angle or horizontally. If cast at an angle or horizontally, there was some difficulty in preventing the core getting out of the straight line. It bent with the heat; and there was the tendency of the metal to lift it. Such things as water-pipes with spigot and socket joints that did not require machining, could be dealt with in the ordinary way; but when they were dealing with columns, things like rams, and so forth, which required machining, it was quite another problem. The author had not dealt much with mixtures, and probably for a very good reason. People who got out specifications for pumping machinery sometimes told the makers what mixtures to employ; and at times this made matters exceedingly difficult for the manufacturers. Different sorts of castings wanted to be treated differently with regard to the mixtures; and in this country, he thought, they were not so far advanced in this particular line as in some other countries. The Germans studied the subject more scientifically. Quite recently they brought out means for compressing iron borings and turnings, and making them into briquettes; and so used up waste products. These borings and turnings did not realize anything like their real value, because it had been found very difficult indeed to melt them up again in the loose state, seeing that a good deal of it was oxidized, and thrown away by the blast. Still it had been realized for years that such fine particles of metal had an exceedingly good effect in getting a close-grain mixture; and with steel added a stronger metal was secured. The Germans had been compressing these finely-divided pieces of metal not only in cast iron, steel, and wrought iron, but in bronzes and aluminium, with excellent results. A number of tons of the briquettes had been sent to different people in this country to try; and it had been established that an inferior mixture of iron could be used by the aid of the briquette, and better results could be obtained.

Mr. R. A. Blakeborough (Brighouse) said there was only one thing he should like to know, and that was as to the shape from top to bottom of the pillars mentioned by the author. Sometimes where there was a large flange on the outside of a column or the casting was of an irregular shape, it was advisable to have more than one header to take away the impurities.

Mr. H. Preston (Grantham) said the author had referred to the decomposition of iron owing to electrical action between the iron and the graphite. They had at times mains which seemed to decompose when placed in the ground. When in clay all the nature of the iron would go out of it. A pick striking it would go straight through without cracking it; and such pipes could be cut with a knife. If the pipes were laid where there was furnace slag, the same action would come about. Was that the action to which Mr. Kennedy had referred? And what was really the chemical action that took place under these two conditions—in clay and in furnace slag?

Mr. Kennedy, in reply, remarked, regarding the question as to briquettes, that his firm had never used them. In the briquettes, steel was sometimes used; but he did not know it was a very desirable thing to do, because it was apt to segregate, and to get into different parts of the metal, making it irregular. It was, however, quite a common thing to use the steels from rolling hot plates. This was not so dangerous as putting in lumps of steel.

Briquettes were not greatly known to metal users in this country. In reference to the large columns, there were flanges at both ends; but there was nothing in the centre, except a test-bar—a piece put in for a test-bar. As to electrical action, where there was graphite in large patches in close contact with large masses of iron, and there was acid in the ground or water, galvanic action was set up, which carried off the iron, either as ferro-carbonate, or some other oxide of iron. The effect was the same whether from inside or outside.

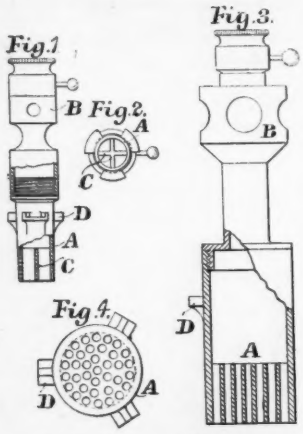
REGISTER OF PATENTS.

Inverted Incandescent Gas-Burners.

ZECHNALL, L., of Bunhill Row, E.C.

No. 12,049; May 21, 1909.

This invention has for its object to provide an inverted incandescent gas-burner with a tube shorter than those generally made, with the consequent advantage that lower gas pressures may be employed, and "lighting-back" is also prevented.



Zechnall's Inverted Burners.

Figs. 1 and 2 are a part section and an inverted plan of one form of this burner; figs. 3 and 4 are similar views of a construction more particularly adapted for large burners.

In figs. 1 and 2, the member A, forming the mouth or end of the burner-tube, is made of clay or other suitable refractory material secured to the lower end of an extension of the mixing-chamber B. It is provided at its lower end with internal partitions C arranged crosswise and extending from the mouth upwards for (say) from $\frac{1}{8}$ inch to $\frac{3}{4}$ inch, so as to provide separate tubular passages opening at the mouth of the burner. In this way, while the mixture of gas and air from the mixing-chamber will issue as separate jets from the tubular passages, they will constitute one flame which has no separate air supply admitted in the midst of it or between the tubular passages.

Figs. 3 and 4 show the form of the invention intended for larger mantles. Here there is a cluster of closely assembled tubular passages evenly distributed over the whole sectional area, so as to give, in the aggregate, a combined flame adequate for the size of mantle employed, and without any separate air admission in the midst of the flame.

Ordinary inverted burners with straight tubes without baffle-plates, but with wire gauze, for (say) a consumption of 4 feet of gas per hour, are, the patentee remarks, generally made with a length from $4\frac{1}{2}$ inches to 5 inches all over from the point of injection of the gas to the mouth of the burner, if good efficiency is to be obtained; while his burners for this consumption need only measure about 3 inches. Gas burners with a consumption of about 12 to 16 feet of gas per hour, with ordinary straight tube and open mouth with wire gauze, to be efficient, have to be made about 8 inches to 9 inches long; while with the burner mouth shown they can be made about $5\frac{1}{2}$ inches long, or even less. The above-mentioned dimensions for the improved burner give satisfactory results when made as herein described. As regards the length of the tubular passages, it is found that, with a gas consumption of about 4 cubic feet per hour, a good length of passage to prevent firing-back is about $\frac{1}{2}$ inch to $\frac{3}{4}$ inch; while in burners with a consumption of (say) 12 to 16 feet of gas per hour, a suitable length is about $\frac{3}{4}$ inch to $1\frac{1}{2}$ inches.

Gas-Lamps.

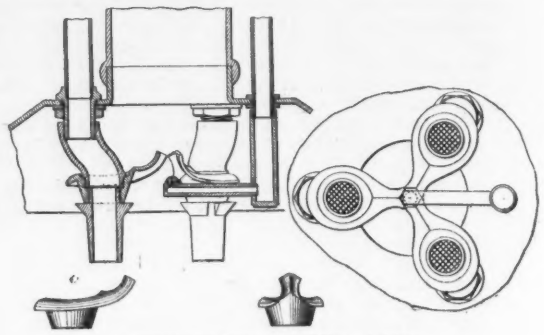
BREEDEN AND CO., J., and BREEDEN, F., of Birmingham.

No. 21,236; Sept. 17, 1909.

This invention relates to gas-lamps having inverted incandescent burners, arranged around, and lighted (on turning on the gas supply) by one centrally arranged pilot or light; the invention having for its object "to provide simple and efficient means for ensuring the lighting of the series of burners by the common pilot or bye-pass light."

On each inverted incandescent burner-tube, at a short distance above the mantle-carriers of the burners, is a collar or flange, having a channel or inverted U or V figure in cross section, each collar or flange having at one side a projecting, and preferably upwardly curved, tongue or arm, also of channel or inverted U or V cross section, and forming a continuation of, or outlet from, the channel in the collar or flange. The collars or flanges are so arranged on the burner-tubes that their projecting tongues are directed radially to the common centre under which the pilot light is situated; and the tongues have such a length that they meet above the pilot light—their ends being preferably so shaped or cut away as to provide an opening immediately above the flame of the pilot light.

When the gas is turned on, a portion of it rising from each burner is trapped by the channelled collars or flanges on the burner-tubes, and is directed by the channelled tongues of the collars or flanges to the pilot light, and, becoming ignited, the light is simultaneously flashed outwardly to the several inverted burners.



Breeden's Gas-Lamp Pilot Lighter.

The illustration shows the burner in vertical section, with a plan of the underside of so much of a three-light gas-lamp as is necessary for illustrating the carrying of the invention into effect. There is also shown, detached, an inside and an end view of the collars or flanges constituting the essential feature of the invention.

The flanges or collars may be permanently fixed to the burner-tubes, or they may be adjustably secured thereon; and they may be of metal or steatite.

Conveying, Cooling, and Discharging Incandescent Coke.

BERLIN-ANHALTISCHE MASCHINENBAU-ACTIEN-GESELLSCHAFT.

No. 18,908; Aug. 17, 1909. Date claimed under International Convention, June 30, 1909.

This invention relates to installations for conveying coke from retorts of the type wherein the receptacle for the coke is driven from the retort, where it receives its charge, to the point where it discharges its contents and back again by means of an endless cable. The object of the invention is so to arrange the installation that one attendant at the mouth of the retorts can control single-handed the whole installation without having to leave his post. A single controlling mechanism is employed to stop the conveyor on its arrival in front of the retort, and for re-starting it after it has received its charge; while the quenching of the incandescent coke and also the discharging of the conveyor or truck are effected automatically.

Fig. 1 (p. 703) shows diagrammatically one form of plant in side elevation. Fig. 2 is a section of fig. 1. Fig. 3 shows, on an enlarged scale, the portion of the track where quenching takes place. Fig. 4 is a section of fig. 3. Fig. 5 shows the portion of the track where the truck is discharged. Fig. 6 is a vertical section of fig. 5. Fig. 7 is a detail view showing a portion of fig. 5 on an enlarged scale. Fig. 8 is an end elevation of fig. 7. Fig. 9 is a horizontal section of fig. 5.

The retort-furnace has a conduit or trench formed in front of it below the ground level, and disposed within the conduit is a track, the length of which in front of the retorts is horizontal, while at the place where the coke is quenched—*i.e.*, between the retorts and the point of discharge—it is given a gradual downward gradient, and on leaving the retort-house rises obliquely upwards to the discharging point, beyond which it is carried with a slight upward gradient on a raised platform. On the track a truck travels driven by an endless cable or the like, guided by rollers between the two rails of the track and driven through a drum by means of an engine.

Below the sprayers A, guide-rollers are arranged between the rails of the track at a certain distance behind each other; while outside the track—for instance, below it and towards the retorts—a third guide-roller is mounted at a distance from the rollers dependent upon the time to be occupied in the quenching of the coke. The endless cable is guided over these three rollers in the form of an open loop; so that its continuity is broken along the track between the rollers. To the cable is secured a driver in the form of a transverse bar, preferably guided on the portions of the track which extend from the rollers to the ends of the track by means of guide-rails secured to the inside of the track rails. Two arms project downwards from either end of the track in the path of the driver; the latter being adapted to co-operate with one or other of these arms, and thus carry the truck along with it. During the travel of the truck, the driver is between the two arms; so that the truck is driven whichever way the cable is moved.

To the upper portion of the truck is secured an adjustable projection co-operating with an arm which extends into its path below the sprayers in such a manner that the supply pipe for the quenching water is automatically opened when the truck arrives below the sprayers, and on the truck continuing its travel is again automatically closed by an auxiliary device, provided with a valve or cock, to the plug of which is secured a counter-weighted arm. A chain, passing over a pulley, has one end secured to the arm; while its other end is connected to a lever provided with a weight, so as to constitute a bell-crank lever.

The stopping of the truck in front of the retort to be discharged, and its restarting when the direction of the cable is reversed, is effected by the attendant at the retorts by an endless controlling cord or band B

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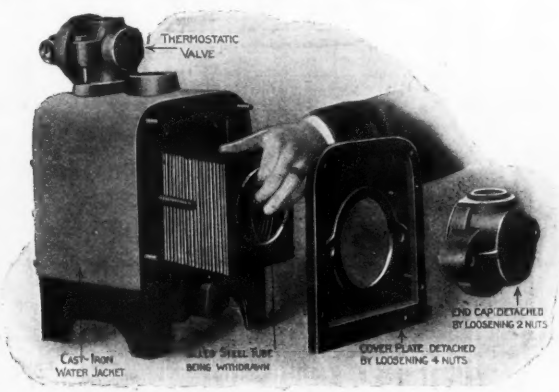
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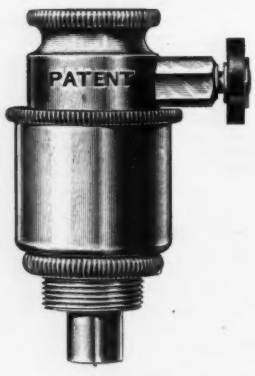

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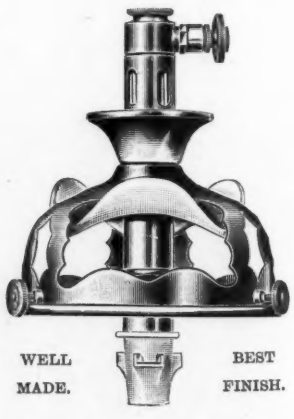

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Polished Brass, Steel Bronzed or Copper Bronzed Finish, same price.
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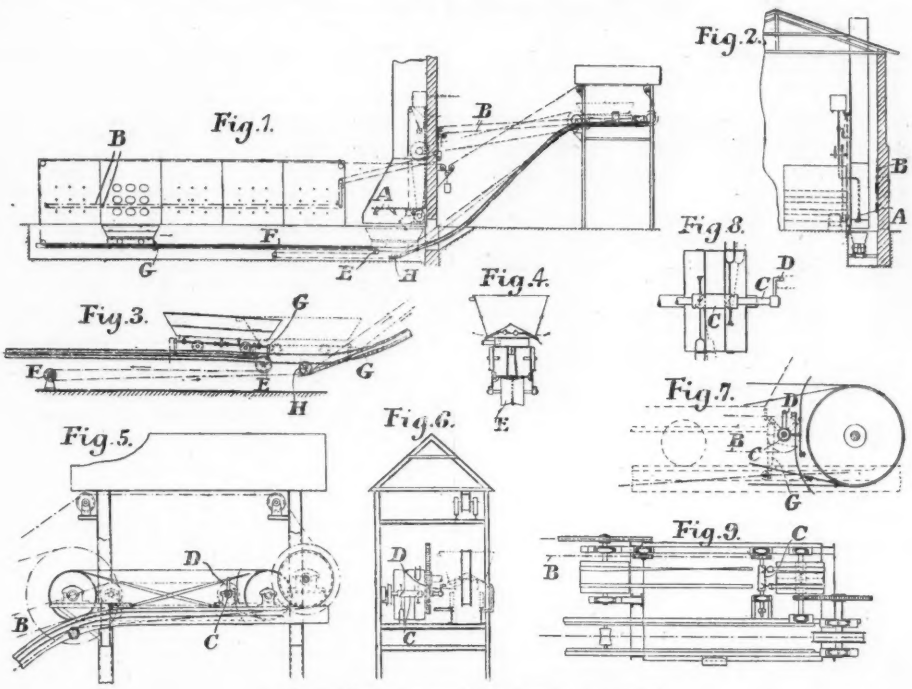


A "Bamag" Coke-Conveying, Cooling, &c., Plant.

carried in front of the furnaces. In order to reverse the movement of the truck when it is at the end of the track, without necessitating the presence of an attendant on the platform, the cable is automatically reversed by the truck itself. To this end a pin-like stop projects from the frame of the truck (fig. 4) into the path of an arm formed on the shifting spindle (fig. 8); this arm constituting a crank C, secured to the spindle in such a manner that when the cable is stationary it remains in the central position shown in full lines in fig. 7.

The working of the apparatus is as follows: When the truck is in front of the retorts to be discharged, the driver is between the arms of the truck, and the belts are running on their loose pulleys; so that the cable is stationary. After the truck has been filled, the attendant at the retorts pulls the controlling cord B (say) from right to left. Owing to the rotation of the spindle C thus effected, the belt forks are shifted to the left, whereby the open belt is transferred from the loose pulley to the fast pulley, and the cable is accordingly driven in such a manner that the driver will travel towards the platform. The crank D is then brought into the position shown by dotted lines in fig. 7.

The driver, after the cable has been started, strikes the arm of the truck and drives the latter until it leaves it at the guide-roller E, and continues its travel round to the guide-roller F. The truck, owing to its momentum or by reason of the downward gradient of the track near the guide-roller E, continues to travel until it reaches the position shown by dotted lines in figs. 1 and 3, when the arm G is situated between the guide-roller H and the platform. The truck is prevented from passing beyond this point by the upward gradient of the track.

On the truck arriving below the sprayers arranged at this stopping place of the truck, a movable arm is turned by a projection on the truck in such a manner that water is discharged from the raised tank on to the incandescent coke. The water-valve is not closed again until, during further travel of the truck, the movable arm is released by the projection. The time during which quenching takes place corresponds to the stoppage of the truck under the sprayers, and depends on the time which the driver takes to travel the distance between the guide-roller E, the roller F, and the arm G of the truck when the latter is stationary. For regulating the time occupied by quenching, the guide-roller F can, therefore, preferably be made adjustable in the longitudinal direction of the track (fig. 3).

Towards the end of the quenching period, the driver has passed into the guide-track, and, by striking the arm of the truck, drives the latter up to the platform. On arriving at the centre, its contents are automatically discharged by an extension of the pawl striking a fixed stop. Moreover, a stop or projection then strikes the crank D; so that the latter is brought from the position shown dotted in fig. 7, beyond its central position, into the position shown by chain dotted lines.

The rotation of the spindle C is thus effected, and the open belt is therefore brought back to the loose pulley by the shifting of the belt forks to the right, whereupon the crossed belt is transferred to the fast pulley. This results in the reversing of the direction of movement of the cable; so that the driver moves towards the retort-bench. Owing to the gradient of the track on the platform, the empty truck, under the action of gravity, rests against the driver, till the latter, just in advance of the guide-roller H, is brought out of the path of the arm G.

The truck is again left stationary under the sprayers, while the driver travels the section of the cable between the guide-rollers H.F.E., preferably in such a manner that the arm is slightly behind the guide-roller E, looking towards the retorts. The arm is connected to the water-valve, actuating mechanism in such a manner that the valve is not opened when the projection on the returning truck strikes it.

The truck is driven up to the retorts again by the striking of the driver against the arm, and is there stopped by the attendant in front of the retorts again operating the cord and, for instance, by his pulling the upper portion of the cord B from right to left. Owing to the rotation of the spindle C thus produced, the crossed belt is brought back again to the loose pulley; so that both the belts travel on their loose pulleys and the crank D is again in its central position. By a second pull on the cord in the same direction, the attendant can again start the cable after the truck has been charged, and so simultaneously restart and reverse the movement of the cable.

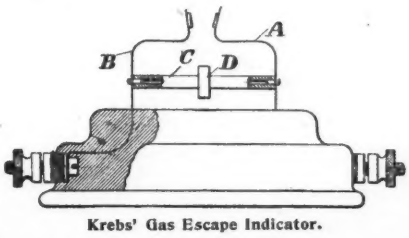
"The whole installation in which the incandescent coke is discharged from the retorts, and after being quenched is unloaded at some distance off, can, therefore, be attended to by a single workman, who need not leave his place in front of the retorts, to which he can therefore readily attend."

Safety Device for Indicating an Escape of Gas.

KREBS, L., of Berlin.

No. 1095; Jan. 15, 1910.

This safety device for indicating an escape of gas is characterized by the provision of two contact springs carrying pins, which, in turn, support a casing containing platinum black.



Krebs' Gas Escape Indicator.

The springs A B are secured to a base of some non-conducting material—wood, compressed fibre, china, or the like. The springs are bent in such a way that when the tube C is broken or removed they come into contact and close an electric bell circuit. Each spring carries a pin adapted to project into the bore of the hollow tube C, of paraffin wax, thereby supporting it in position. The tube carries a receptacle D, adapted to contain platinum black. Thus, in case of a gas escape, the presence of the gas will heat the platinum black in the casing D, and this heat will be transmitted to the wax, which will melt and allow the springs to come into contact and close the alarm bell circuit.

Unprofitable Electricity Supply at Acton.—After a controversy extending over three years, the Acton District Council have decided, by 12 votes to 10, to hand over their electricity undertaking to the Metropolitan Electric Supply Company. The proposal is to lease the undertaking for 37 years; the Company paying all the Council's loan charges, and handing back the undertaking to the Council at the end of the term, if so required. The following remarks on the subject appeared under the heading of "The Best of a Bad Job" in the "Occasional Notes" in the "Pall Mall Gazette" yesterday: "The sacred duty of wasting public money overrides all other principles with the advocates of Municipal Socialism, and the Acton District Council is naturally meeting with severe condemnation from these sources for its courage in admitting that its electrical administration has been a failure. The Council has decided to negotiate for terms upon which to hand over its electric supply business to a private company; and, looking to the history of the concern, it must be recognized that the proceeding is wisely inspired. The business has been a prolific creator of deficits and a serious burden upon the rates; and the ædiles of Acton have shown hard-headed sense in facing their losses, and deciding not to go 'double or quits.'"

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The House re-assembled last Wednesday after the recess consequent on the national mourning; and since then the following further progress has been made with Bills:—

Bill brought from the Commons, read the first time, and referred to the Examiners: South Hants Water Bill.

Bills read the third time and passed: Great Grimsby Gas Bill, Havant Gas Bill.

Petitions against the Glasgow Gas Consolidation Bill have been presented by the County Council of Lanark, the Baillieston Gas Company, the Glasgow Houseowners' Association and others, and manufacturers, engineers, and others within the gas-supply area of the Corporation of Glasgow; also against the Water Orders Confirmation Bill, in respect of the Chelsham and Woldingham Water Order, by owners and occupiers of property in the places named.

HOUSE OF COMMONS.

Since the House re-assembled last Wednesday, the following further progress has been made with Bills:—

Bill brought from the Lords, read the first time, and referred to the Examiners: Havant Gas Bill.

Bills read a second time and committed: Cambridge University and Town Water Bill [Lords], Garnant Gas Bill [Lords], Matlock Bath and Scarthin Nick Urban District Council Bill [Lords], Thorne and District Water Bill [Lords], Water Provisional Order Bill.

Bills reported, with amendments: Fylde Water Board Bill, Middlesbrough Corporation Bill, Shirebrook and District Gas Bill, Southend Water Bill [Lords].

Bills read the third time and passed: Farnham Gas and Electricity Bill [Lords], South Hants Water Bill.

The Gas Companies (Standard Burner) Bills [Lords] stood for second reading on Thursday; but Mr. Holt (Hexham) gave notice of his intention to move their rejection, and the second reading was accordingly postponed till Tuesday (to-day). Mr. G. H. Roberts, the Labour Member for Norwich, has also put similar notices upon the paper. The following authorities have petitioned against the Bills:—

No. 1 Bill—The Bootle, Hastings, Liverpool, and Torquay Corporations; the Allerton, Great Crosby, Ilford, Litherland, and Waterloo with Seaforth Urban District Councils; and the Mersey Docks and Harbour Board.

No. 2 Bill—the Bournemouth, Cambridge, Faversham, Hemel Hempsted, Reading, and Shrewsbury Corporations; and the Harrow-on-the-Hill and Wealdstone Urban District Councils.

No. 3 Bill—the Bath, Exeter, Guildford, Southampton, and Wolverhampton Corporations; and the Romford Urban District Council.

Petitions against the Cambridge University and Town Water Bill [Lords] have been presented by the Cambridge Corporation and the Cambridgeshire County Council; against the Warrington Corporation Bill, by the Runcorn Rural District Council; and against the Water Provisional Order Bill, by the Kingswood Water Company.

SHIREBROOK AND DISTRICT GAS BILL.

House of Commons Committee.—Thursday, June 9.

(*Before Sir* LUKE WHITE, *Chairman*, *Mr.* WORTHINGTON EVANS, *Mr.* WHELER, *and Mr.* BARTON.)

This Bill came up for consideration to-day; its object being to extend the limits of supply of the Shirebrook and District Gas Company, and to repeal certain powers at present vested respectively in the Mansfield Corporation and the Bolsover Gaslight and Coke Company.

Mr. HONORATUS LLOYD, K.C., and Mr. R. S. CLEASE appeared for the promoters; the Warsop District Council and the Mansfield Corporation were represented by Mr. C. C. HUTCHINSON.

Mr. HONORATUS LLOYD, in opening the case for the Bill, said the Shirebrook Gas Company were incorporated by Act of Parliament in 1899. Part of the area proposed was within the limits of the Bolsover Company; but they had not given a supply. There were two parishes proposed to be included within the limits, which were at present in no authorized area of supply. The parish of Bolsover, which belonged to the Duke of Portland, was anxious for a supply; and arrangements had been made that a supply should be given. The portion of the proposed area on which the opposition arose was a part of the parish of Warsop which was not included in the Shirebrook Company's limits in their Act of 1899. When the Act was obtained, there was included in their limits a portion of the parish of Warsop; and they were now asking for the remainder. In 1878, the predecessors of the Mansfield Corporation obtained powers enabling them to supply gas in the parish of Warsop, with the consent of the Sanitary Authority; but no supply had been given. In 1899, an arrangement was made as to the supply. The Mansfield Corporation did not oppose their taking part of the parish; and the Corporation were still left with the right and obligation to supply another portion of the parish of Warsop. This portion had never been supplied by the Corporation; and now there was a very substantial demand for better lighting in the remainder of the parish. Upon the Shirebrook Company setting to work to give this supply, the Corporation asked whether the Company intended to make them any offer. The Company refused to do so, upon the ground that the Corporation and their predecessors had had vested in them, since 1878, the power to supply by the consent of the Sanitary Authority. In 1901, they obtained the repeal of the proviso which required the consent of the Sanitary Authority; but the Sanitary Authority of Warsop had the right to purchase that part of the undertaking which was within their own area. The Mansfield Corporation had, however, been advised that the capital expenditure they would have to make was such that, having regard to the distance and the difference of levels between their works and Warsop, it would not be remunerative to do so; and they had not done it. It was not usual for local authorities to offer for sale concessions which Parliament had granted them. When the Shirebrook Company were before Parliament in 1899, they got rid of the opposition of the Mansfield Corporation for £500. But Parliament would not allow such a provision in the Bill; and it was therefore struck out. However, the Corporation had the £500. Warsop had certain rights with respect to gas supply; and under the Mansfield Act of 1878 they had the right to purchase part of the Mansfield undertaking. The remainder of the parish of Warsop, however, would not in itself be sufficient to enable them to set up works on a sufficiently large scale and to supply gas at anything like the price at which the Shirebrook Company could supply. Although the maximum price was 5s. per 1000 cubic feet, they had never charged more than 3s. 6d.; and they were now supplying at 3s. 4d., which was the highest price according to a scale by which large consumers paid less, and it came down from 3s. 6d. to 2s. 9d. for lighting. The output had grown to 25 millions. The Shirebrook Company thought it was in the interests of the consumers that they should supply the area. The Warsop Local Authority, however, were advised that they could give the supply equally economically; and they applied to the Local Government Board for an Order under the Gas and Water Facilities Act to enable them to set up gas-works for themselves. In March of the present year, a local inquiry was held; and the Local Government Board refused the Order. Accordingly, the present position was that there was a district in which it was admitted that lighting facilities were required. The Shirebrook Company were prepared to give the facilities by the extension of their limits of supply, and the consumers would then get gas at a price at which they could not get it in any other way. Having dealt with the joint petition of the Warsop Council and the Mansfield Corporation, Counsel was proceeding to call evidence in support of the Bill when

Mr. HUTCHINSON remarked that his clients wished to retain the rights possessed by them under their Act of 1878. Warsop was not prepared to supply gas at the present moment; but they wanted gas, and the promoters ought to have some little time to recoup themselves for the special expenditure incurred. They would incur no capital expenditure on works or mains, because they had them. There were the distributing mains; and they would only have to put in small distributing pipes. He asked for the preservation of their rights subject to a period during which he would bind himself not to exercise these rights. This might give the Shirebrook Company an opportunity of recouping themselves for their expenditure, and would continue the right that had been given to his clients by Parliament. The Mansfield Corporation would also be bound to accept this.

Mr. HONORATUS LLOYD then conferred with the Shirebrook Company's representatives, and announced that he thought they would be able to come to an arrangement.

When the matter came again before the Committee later in the day, the clauses were formally adjusted; and the Bill was ordered to be reported.

LEGAL INTELLIGENCE.

MAIN DAMAGED BY A TRACTION-ENGINE.

At the Epsom County Court last Wednesday, before his Honour Judge Harington, Messrs. Richardson and Co., haulage contractors, of Epsom, were sued by the Leatherhead and District Water Company to recover £1 17s. 9d. for damage done to one of their mains by a traction-engine. A witness deposed to seeing the engine, with two trucks of bricks attached to it, pass along the road in which the main was laid at a depth of 1 ft. 9 in., and afterwards there was a sudden spurting of water. The Company's outdoor superintendent (Mr. J. Cowan) said he had examined the broken pipe, and, except for the fracture, it was in very good condition. In answer to Mr. T. Bell, who appeared for defendants, he said the Company's new pipes were laid at a depth of 3 feet, really as a protection against frost. Mr. G. T. Derry, the Manager and Resident Engineer of the Sutton Water Company, said he found that the pipes were of the thickness and depth usual when they were put in. Mr. Bell contended that the statutes governing traction-engines placed no restriction upon their use on the highway; and he submitted that the plaintiffs' pipes were not laid at a sufficient depth.

His Honour, in giving judgment for the amount claimed, with costs on the higher scale, said he thought the plaintiffs were entitled to recover. The actual damage was caused owing to the traction-engine and trucks passing over the pipe; and there was no evidence to show that the main was not in a perfectly sound condition prior to the actual breakage. The main was properly laid, having regard to the period when it was laid and to the requirements then in vogue. The Company were bound to lay these mains to supply water; and it would be perfectly unreasonable to say that, because when these pipes were laid they were only put 1 ft. 9 in. deep, now the Company should be compelled to lower the mains to 2 ft. 6 in. on account of the alteration in the character of the traffic which used the road. It appeared that the Locomotive Act was a permissive Act, to allow owners of traction-

engines to make use of the roads; and he was quite satisfied that no exemption was given under that Act from liability for damage which might be done by locomotives so using the road. He thought it was clear that engines must be so employed as not to be a nuisance or cause damage to persons having the use of the roads. This being so, it seemed to him the owner of the traction-engine must be held liable.

AFFAIRS OF THE MID OXFORDSHIRE GAS COMPANY.

In re a Petition of a Debenture Holder.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, June 7.

(*Before Mr. Justice* SWINFEN EADY.)

The petition of a debenture holder for the winding-up of the Company, which was considered by his Lordship on the 25th ult. (*ante*, p. 570), came up again to-day.

The Hon. FRANK RUSSELL, K.C., who appeared with Mr. NOAD for the petitioner, who had obtained judgment for £736, said he asked for a compulsory order, notwithstanding that a resolution had been passed for voluntary winding up. The petition was presented on April 19, the date for which it was to be answered being May 3. When it was served, the Company's Solicitors approached the petitioner's Solicitors, and, by the payment of £100 down and a promise to provide for the satisfaction of the whole claim, induced them to defer the hearing until May 24. They did nothing further, however, with regard to the settlement of the claim, but called an extraordinary general meeting at Bicester—the registered office being in London, and the central office at Oxford—and on May 29 a resolution was passed for winding-up voluntarily. The Company was incorporated on Oct. 10, 1905, with a share capital of £50,000, in 2500 preference shares of £10 each, and 2500 ordinary shares of like amount. There had been issued 1282 preference and 198 ordinary shares, which were fully paid, except £180 10s. unpaid calls. According to the last accounts, there was a balance to the debit of the revenue account of £1422 odd, and to the debit of capital account of £18,402. The capital expenditure during the year was £22,914; and there was a debenture debt of £58,530 (about four times the issued capital), and the unsecured creditors were £62,916. The Company was formed under the following circumstances: In the year 1905, there were various small gas undertakings in different villages and small towns in Oxfordshire, such as Bicester, Chipping Norton, Woodstock, Shipton, &c.; and the Company was formed to take them over—the promoters being the Finance and Construction Company, Limited, and Mr. E. O. Preston, who held all the founders' shares in the Company named. There was a denial by the present Secretary of the Company that Mr. Preston was a promoter; but he had not denied it himself. On March 27, 1906, a prospectus was issued, offering for subscription £15,000, of 5 per cent. debenture stock, 2000 5½ per cent. preference shares, and 2000 ordinary shares, for the purpose of completing the purchase of the several gas undertakings enumerated, making improvements in the plant, &c., and defraying the expense of an application to Parliament. It appeared that the Company's application to Parliament was rejected by the Committee, on the ground that the finances of the Company were unsatisfactory. The prospectus set out the price of other gas companies' shares, and referred to an agreement of March 23 with the Finance and Construction Company. In addition to the debenture stock offered for subscription, it stated that certain special debentures and special debenture stock had been issued, or agreed to be issued, to the various vendors, which were a first charge on the properties purchased, and, subject to this, ranked *pari passu* with the other debentures; these special debentures, giving a first charge, amounted to £53,051.

His LORDSHIP, interposing, asked what was the result of the statutory meeting of creditors, under the voluntary liquidation.

Mr. RUSSELL said he did not know; but the Liquidator gave the petitioner no notice of the meeting.

Mr. CHRISTOPHER JAMES said the Liquidator appeared to have been under the impression that debenture holders were not creditors.

Justice SWINFEN EADY: Then the statutory meeting has never been properly convened.

Mr. JAMES said he must admit there had been an irregularity.

His LORDSHIP asked if the Liquidator was connected with the Company?

Mr. RUSSELL said the Liquidator (Mr. A. H. Stephens) had filed an affidavit in which he said he did not know anything about Mr. Preston or the Directors, and was absolutely independent. He also said it was not his practice, when acting as Liquidator, to summon debenture holders to a meeting of creditors. He summoned the unsecured creditors, according to a list furnished to him by the Secretary. The amount due to debenture holders was upwards of £50,000, and to other creditors £16,000, which included a claim for more than £6000 by Mr. Preston, which required investigation.

His LORDSHIP asked if there was any affidavit stating the result of the meeting.

Mr. JAMES said there was not; but he was informed that a resolution confirming the appointment of the Liquidator was passed unanimously.

After some further discussion,

His LORDSHIP said the petition must stand over until a proper meeting had been held.

Mr. RUSSELL said he was informed that at Chipping Norton the gas supply had ceased.

Mr. JAMES said this was one of the undertakings of which the Receiver and Manager was in possession at the instance of the debenture holders.

His LORDSHIP said he might not have any assets with which to buy coal or make gas. It must be assumed that he was doing all he could until there was some evidence to the contrary.

It was ultimately arranged that the Liquidator should summon a meeting of all the creditors, to be held in London on the 21st inst.; the petition to stand over till the Tuesday following.

ACTION IN RESPECT OF GAS-GOVERNORS.

A case of importance to gas consumers came before his Honour Judge Willis in the Southwark County Court last Tuesday, when "The Hornsey Journal, Limited," were sued by Messrs. W. Tice and Co. (New Company), Limited, of Union Street, S.E., in respect of £11 10s. alleged to be due to them for supplying and fixing gas-saving appliances at the defendants' printing works.

Mr. BLACKWELL, who appeared for the plaintiffs, said they were manufacturers of a governor for regulating and lessening the quantity of gas consumed. They sent out a circular-letter advertising the appliance, and on Sept. 22 last they received a post-card from defendants asking for particulars. This led to negotiations; and there was a letter from the plaintiffs to the defendants on Sept. 29 which contained the terms of the contract in dispute. This letter was as follows: "We beg to thank you for permission given our representative to supply the automatic gas-saving apparatus free of all cost for three months upon the understanding that unless the lighting meter effects a saving of 15 to 25 per cent., and the engine meter a saving of 10 to 20 per cent., as compared with the corresponding quarter, we will, at your request, remove them without charging anything. But if they effect a saving, you are to purchase the lighting meter for the sum of £6 10s., and the engine meter for the sum of £5 10s., on a seven years' guarantee that we keep them in working order. In the event of faulty registration of the meters, or any variation of the conditions as compared with the corresponding quarter, we stipulate for a short test, with or without the apparatus working." The governors were installed on Oct. 2; but at Christmas the defendants wrote to say that their gas bills were heavier than in the corresponding quarter. A short test was then made, which, according to the plaintiffs, showed a saving of 23 per cent. on the lighting and 15 per cent. on the engine power. It was this test that was really in dispute. The plaintiffs' representative called upon Mr. Wiltshire, the Chairman of the defendant Company, and it was arranged that he (the representative) should make the test on the following Wednesday.

His HONOUR asked if Mr. Wiltshire agreed to the test being made, because if he did not, it seemed that the plaintiffs had no case.

Mr. DEANS, who appeared for the defendants, said this would be his submission. He added that subsequently the defendants themselves had a test made by Mr. Browning, of the Gaslight and Coke Company, whose figures did not agree with those of Tice's representative.

Evidence for the plaintiffs was then called.

Reginald Conway, a traveller in their employ, said he called on Mr. Wiltshire just after Christmas last, and was told there was no reduction in the gas bill from the use of the governors. He said he wanted to make a short test to see if there had been fluctuations; and Mr. Wiltshire called the foreman and told him to make arrangements for the machines to be worked for half-an-hour the following Wednesday, so that witness could make the test. Witness, accompanied by a fitter, made the test. Defendants' foreman said he was too busy to see to it, and sent the "engineer" to look after the test. Witness first tested the light meter without the governor for half-an-hour, in which time it registered 65 cubic feet of gas. Tested for the same period with the governor at work, it passed 50 cubic feet, which was a saving of 23 per cent. The engine meter, similarly tested, showed a saving of 10 feet in the half hour when the governor was in action, or 15 per cent. The "engineer" checked the figures with him. Witness was present when Mr. Browning made the test for the defendants, and, so far as he was aware, it was a fair one. It showed a saving of 2 per cent. on the engine gas and 14 per cent. on the lighting. He could not account for the difference in the figures, except that there must have been less pressure of gas during Mr. Browning's test.

In cross-examination by Mr. DEANS, witness said Mr. Browning used a stop-watch, and only made five-minute tests, which, as pressure fluctuated every minute, would not show an average like half-hour tests. He told Mr. Browning that, so far as his knowledge of such matters went, he was satisfied with the test. He now thought there must have been more pressure of gas from the main when he made his own test, which would result in more saving. He admitted that when he made his test he was checking on a dial registering 100 feet in fractions, and that when the indicator hand was between the figures he had to guess the exact quantity of gas measured; whereas Mr. Browning used an indicator which measured 10 cubic feet of gas in fractions, so that he could tell when one-fifth of a foot had been consumed. All the same, he did not think his test was far wrong.

Alfred Weymark, an employee of the plaintiffs, said gas pressure would make a difference in the tests, and it varied considerably. If the pressure was low when a test was made, it would have no effect on the plaintiffs' apparatus; but it would affect the test as to the gas saved with and without the apparatus working. It would be usual at a test for both sides to agree as to the reading of the indicator hand.

This concluded the evidence for the plaintiffs.

Mr. *W. H. Wiltshire* then gave evidence on the point of his alleged agreement to the test. He said when Mr. Conway called upon him about the matter he had quite forgotten the clause in the letter of Sept. 29 as to a short test being required by the plaintiffs as a condition binding the contract. Witness saw his foreman, and told him to make arrangements for Mr. Conway to test the governors. His idea was that the plaintiffs merely wanted to ascertain if they were working properly. The "engineer" who actually assisted Mr. Conway was only a machine minder.

In cross-examination by Mr. BLACKWELL, witness said it was only in consequence of something Mr. Conway said the day after he had made his test that he (witness) looked up the letter.

Judge WILLIS said he did not think the clause in the letter indicated that the parties were to agree that the conditions should be fulfilled by such a test as the one made. They ought to say what kind of test it should be.

Mr. BLACKWELL then addressed the Court on this point; arguing that as the defendants had had the governors for the stipulated three months, they must have been aware that the test made was to determine whether or not they were satisfactory, with a view to binding the contract.

Judge WILLIS said they must have an honest test; and he did not think this was one. The whole thing depended upon whether Mr. Wiltshire deputed his foreman to properly check the test; and he (his Honour) did not believe he did. From Mr. Conway's evidence, he could scarcely come to the conclusion that it was distinctly pointed out that the test he was going to make was to be binding on the defendants as to whether or not the conditions under which they were to purchase the apparatus had been fulfilled. There was no one to see that the test was properly carried out, and he (his Honour) was therefore satisfied that defendants never consented to it as being binding upon them. There must consequently be judgment for the defendants, with costs.

Mr. DEANS applied for costs on the higher scale, as, he said, the case was a technical one, and had involved heavy expenses.

His HONOUR refused the application.

LIABILITY FOR A DEFECTIVE STOPCOCK BOX.

In the King's Bench Division of the High Court of Justice last Thursday week, Mr. Justice Channell (sitting without a Jury) had before him a claim by Miss Leah Rosenbaum against the Metropolitan Water Board for damages for personal injuries alleged to have been caused to her through the negligence of the Board's servants. The only question his Lordship had to try was that of liability, as the amount of damages had been settled. On Jan. 18, 1909, the plaintiff was crossing Oxford Street close to Regent Circus. In the middle of the road at this point there is a refuge, and on the north side of it a stopcock box. In the ordinary way, the tube containing the stopcock is filled up with a wad of straw, to make it level with the road. In the present case, however, the wad had either not been properly inserted or had been allowed to fritter away until there was a depression. No metal cover was used over the tube. The heel of plaintiff's shoe apparently caught in the depression, with the result that she was thrown to the ground and her leg strained and bruised. These facts were stated to his Lordship by Mr. Norman Craig, K.C., who, with Mr. M'Cardie, appeared for the plaintiff. Mr. J. Eldon Bankes, K.C., who, with Mr. A. B. Shaw, represented the defendants, said his case was that this particular stopcock was the property of the Borough Council, and it was their duty to repair it. Evidence was given for the defence by officials of the Board, to the effect that the hole had been properly wadded before the accident; that there were thousands of these holes all over London, and that the number of accidents which had happened on account of them for many years past could be counted on one's fingers; and, further, that in regard to the risk of accident it made little or no difference whether or not the holes were wadded. Mr. Shaw submitted that there was no evidence of negligence making anyone liable; but that if there was negligence it was the Borough Council who were responsible. Mr. Norman Craig contended that the defendants were under statutory obligation to keep these holes in such a condition that they were not dangerous to the public. His Lordship, in giving judgment, said the difficulty he had was in seeing that this plug hole, even if it had no wad of straw, exceeded the limit of things which had a certain amount of danger in them, but which nevertheless were lawful, and did not give rise to a cause of action from their mere existence when an accident happened through them. He considered, however, he was justified in holding that the public had a right to complain of these holes being without the usual wads of straw; and he could not help thinking that they were not inspected frequently enough, especially in a place like Oxford Street. He thought a Jury would come to the conclusion that an efficient wad of straw had not been put in when the stopcock was last examined, and that the hole was in fact dangerous at the time of the accident, through not having the usual protection to which people had become accustomed for many years. He was also of opinion that the liability to keep these things in order rested upon the Water Board. He therefore gave judgment for the plaintiff for the amount agreed (£150), with costs. Execution was stayed in view of an appeal.

Liquidation of the Automatic Gas Lighter, Limited.

The statutory meetings of the creditors and shareholders interested under this liquidation were held at the Board of Trade Offices, Carey Street, W.C., last Wednesday, under the presidency of Mr. H. M. Winearls, the Assistant Official Receiver. The Chairman, after dealing with the proofs of debt lodged, stated that the Company carried on business at 3, East India Avenue, E.C.; and he had not been able to obtain much information in regard to its affairs. The winding-up order was made on the 18th of May, on the petition of Mr. Ernest E. Jessel, the former Secretary and a judgment creditor. No statement of affairs had been lodged. Most of the Directors were resident in France. Only one of them had replied to the Official Receiver's communication; and he said he was not in a position to furnish any information. The Company was registered in England in March last year with a nominal capital of £60,000, divided into 58,000 ordinary shares of £1 each and 20,000 deferred shares of 2s. each; and 30,000 of the former, and 19,500 of the latter had been issued as fully paid. The calls unpaid were returned at £7438; but this figure seemed to the Official Receiver to be obviously incorrect. The Company was formed to acquire certain patents relating to a system of lighting gas-burners from a distance, by means of a switch attachment, known as the "Zenith," and also a patent for the automatic lighting of advertisements by means of gas. The patent rights were owned by three persons who transferred them to the Company for 19,000 fully-paid ordinary and 10,000 fully-paid deferred shares. The Official Receiver had been unable to obtain any books of account showing the results of the trading. Proceedings had been instituted in France against the Company, and it had there been declared to be in a state of bankruptcy. The whole of the assets were in the possession of the Trustee, and their value was unknown to the Official Receiver. It had been suggested that Mr. Jessel should be appointed as Liquidator in this country; but it was quite clear that nothing could be done for the English creditors. At both meetings a unanimous resolution was passed for Mr. Jessel's appointment as Liquidator; and a Committee of Inspection was also nominated.

MISCELLANEOUS NEWS.

LISBURN GAS ARBITRATION.

At the Surveyors' Institution, Great George Street, Westminster, on Saturday, the arbitration proceedings were resumed in respect to the purchase of the undertaking of the Lisburn Gas Company by the Urban District Council (*ante* p. 570). Mr. RAM, K.C., was Umpire; the Arbitrators were Mr. CORBET WOODALL and Mr. H. E. JONES.

The Gas Company were represented by Mr. JOHN GORDON, K.C., M.P., and Mr. R. S. CLEASE; Mr. HONORATUS LLOYD, K.C., Mr. VESEY KNOX, K.C., and Mr. C. C. HUTCHINSON appeared for the Urban District Council.

Mr. *C. H. Spencer* gave further evidence on behalf of the Urban District Council. He said the total subscribed capital of the Company was £12,000, which included £4700 cash introduced into the concern. There was £5900 transferred from time to time from reserve, and £200 from the profit and loss account. In 1878, the assets were written-up to the extent of £1200; and the share capital was written-up by a similar amount. A sum of £250 premium was paid on 100 shares issued in 1872. This was not carried to capital, but to the reserve fund. The total amount of capital expenditure was £22,822, which did not include £1200 by which the assets were written-up on revaluation. This was made up of original outlay £2486, extension of works and mains £16,642, property purchased £1971, and there were sundry sales of £67. The expenditure upon meters and stoves was £1788. Of the total capital expenditure, the shareholders had subscribed £4950; the rest had been found by the consumers in one form or another. Many renewals had been charged to capital. The sum written-off for depreciation was £9762 gross. Witness was proceeding to give figures to show what had been the position of the Company from its commencement when

Mr. GORDON objected. He said the figures which had already been placed before the tribunal were agreed between Mr. Cash for the Company and Mr. Spencer for the Council.

Witness said he agreed with Mr. Cash to put in certain figures in regard to capital; but there was nothing said as to how far they should go back in the accounts.

Mr. HONORATUS LLOYD said the point he was going to lay before the tribunal was that the Company, under existing circumstances, must be regarded as a future statutory concern, and they had to consider what was the capital upon which it should be based. He wished to show what was the fair capital; and he wanted to see that they got every penny which they were entitled to as represented by works. And whether the works had gone out of sight and into oblivion, he would give the Company every penny which they themselves, from their earliest start, had called capital expenditure.

Mr. GORDON eventually agreed to the figure of £22,822 for actual capital expenditure; but this did not include any sum in respect of working capital, or the registration of the two Companies. The two last items were estimated at £2500 and £300 respectively.

In reply to Mr. HONORATUS LLOYD, witness said that at the present time they could not raise loans upon as favourable terms as was the case a few years ago. In 1896, money was freely offered at 2½ per cent.; to-day the rate was 3½ to 4 per cent.

Mr. H. E. JONES asked what the price of gas was prior to the years which the tribunal had before them. It looked as though this was a low-priced Company; but it might be that they were doing their improvements out of the extra price of gas. He wanted to find where the money came from.

Mr. HONORATUS LLOYD said they were unable to find out, because they could not see the books.

Mr. *Leonard*, a plumber residing in Lisburn, said that for a period of years there had been general complaints as to the gas supply, and particularly by the users of incandescent lighting, because of inadequate pressure. When the general lighting began, the pressure dropped. He had seen the officials of the Company pumping water out of the mains day after day for several days in particularly wet weather.

Mr. *M'Murray*, a member of the Urban District Council, said that in his laundry he had been very dissatisfied with the gas supply, and had installed electric light in part of his works.

Mr. HONORATUS LLOYD then addressed the tribunal on behalf of the Urban District Council. He said there was going to be an important point in this case, because it seemed to him that the history of non-statutory gas companies had now reached a pitch when very careful consideration would have to be given to their value. He was going to take the responsibility in this case of saying that, having regard to all the circumstances, and having regard to the evidence given by both sides, and the admissions made by Mr. Stevenson on behalf of the claimants, the only way of valuing the Company was to take its future as that of a statutory concern. He was going to put before the tribunal, as a point of law, that, although at the date of the notice to treat the undertaking was a non-statutory one, and not subjects to any legal restriction as to the amount of profit which should be divided, the Umpire and Arbitrators were bound to take into account the likelihood that the Company, if it had continued to exist, would have become a statutory concern, and to use their judgment as to when that time would have arisen and what restriction, according to the practice of Parliament, would have been imposed. And in fixing the purchase price, the maintainable profit as from that time should be taken at a sum not exceeding that which, under statutory restrictions, the shareholders would have been allowed to divide. He asked the Umpire, if there was any disagreement about it, and he did not see his way to accept the principle, to make his award in the form of a special case. It appeared to him to be a most interesting point, and one worth discussing. The importance, to his mind, arose because non-statutory companies had for many years enjoyed a sort of existence which it was a little difficult to account for. Any man had a right to go and set up a business; and if somebody obtained compulsory powers to take his

premises, and it involved the destruction of his business, he had a claim. He was not going to say that a non-statutory gas company was in exactly the same position. Such security as non-statutory companies had in the past enjoyed had been due to the fact that local authorities had supposed that they had power to grant rights. In recent years, local authorities had awakened to their position, and they knew they had no right to allow non-statutory companies to break up the streets; and it was becoming more and more difficult for a non-statutory company to exist. Nowadays, their position was a precarious one. The time had come when non-statutory companies, if they were going to exist, must obtain parliamentary powers; and this Company recognized that, the moment attention was being called to their affairs, their only chance of a future existence was as a statutory concern. Mr. Stevenson, the expert witness for the Company, agreed that, in all probability, this would have been the case. If the Company obtained a sum of money which they could invest in an undertaking as well secured and give them a similar income, they would get an absolute equivalent of what they had got.

Mr. GORDON, in replying, remarked that the process of arriving at the figure of compensation indicated by Mr. Lloyd should have been inserted in their Bill. But this was not done because Parliament would never have allowed it; and it was hopeless to put it before the present tribunal. If a case were stated, it would never be maintained. The undertaking must be valued as a non-statutory concern. The maintainable profit was £2200; and there was a prospective profit of £3100.

The award, after consideration, will be given.

HIGH-PRESSURE GAS IN BIRMINGHAM.

Important Developments.

The "Birmingham Daily Post" for last Wednesday contained an article dealing with the preparations now being made for the supply of high-pressure gas in the city. It was, of course, written for ordinary readers; but the following extracts are of technical interest.

Within the last few days, the activities of the Birmingham Gas Department have been brought prominently before the eyes of the people in the centre of the city by the laying of a gas-main in New Street. This marks the completion of the first part of a scheme that promises ultimately to be of far-reaching importance in relation to developments of the gas undertaking, especially in reference to industrial and public lighting requirements. The main is being laid for the supply of high-pressure gas, which represents the latest of the many advances that have been made in recent years in the production and application of gas for lighting and heating purposes. The new pipe already extends from the Windsor Street Gas-Works to New Street—a distance of about a mile. It is a 24-inch main, and from it will branch smaller pipes, according to the requirements of supply. In laying down plant for a high-pressure scheme, the department primarily had in view the reinforcement of the existing low-pressure distributing system in order to provide for the needs of the outlying districts in the area supplied by the Corporation. For this purpose the high-pressure gas will be governed down to ordinary pressures; but it is also proposed to provide for high-pressure gas lighting and for the supply of high-pressure gas for furnace heating of all kinds. In a city like Birmingham, it is expected that it will be found especially useful in the jewellery and metal trades for annealing, melting, case-hardening, brazing, and so on; and the Gas Department look to a development in this direction as a means of creating a new and increased industrial demand for gas. It is probable that in the high-pressure system will be found the means of supplying these increasing demands on the most economical lines. At any rate, it promises to obviate the necessity for the construction of new gasholders and the laying or relaying of the large and costly mains required for the distribution of gas on the low-pressure system.

In regard to public lighting and the application of high-pressure gas to industrial uses, there is no question of its value and great advantages. For some time Victoria Square has been lighted by gas raised to 30 inches water pressure by means of a small compressor situated in the basement of the Council House. The result has been very satisfactory; but the lamp at the Town Hall corner, opposite the Post Office, shows a light produced from gas at 55 inches water pressure, and the increased illumination as compared with the other high pressure has been very noticeable. It is now proposed to light the whole of Victoria Square with high-pressure gas at 55 inches, and to use inverted instead of upright mantles. The lighting of the space in front of the Council House is, and has always been, done freely by the Gas Department, who use the square as a demonstration-ground for the latest developments in gas illumination. The responsibility for the lighting of the city as a whole rests with the Public Works Department; and it is expected that they will seize the opportunity of the laying of the high-pressure main to have the principal streets along its track illuminated by means of the improved light. There is abundant evidence that, for the special purposes of the manufacturing metal trades that form so large a feature of Birmingham's industries, high-pressure gas has great advantages over gas at ordinary pressures, and even over many kinds of coke-furnaces. For this reason, it is expected that ultimately there will be a considerable demand for the new supply in the jewellery district. It is pointed out that with high-pressure gas the temperature required for the processes of annealing, melting, case-hardening, brazing, and the like, can be quickly obtained, the heat can be regulated to a nicety, and it can be maintained uniformly at the degree desired. This latter advantage is one of considerable value; but, in addition, the use of high-pressure gas yields substantial gains in the economies effected. The consumption of gas required to produce desired results is about 50 per cent. of the quantity necessary at ordinary pressures; and the effects are obtained in about one-third of the time needed under the old system.

Dr. Davidson, Chief Chemist to the Gas Department, estimates that the use of high-pressure gas industrially leads to a saving of 60 per cent. in cost as compared with heating at low pressures. As the result of experiments, he has stated that 10 lbs. of copper can be melted for less than 1d. with gas at 1s. 6d. per 1000 cubic feet. Some slight modification of the ordinary furnace is required when high-pressure gas is employed; and for some time the Gas Department have been conducting experiments in order to devise forms of furnaces most suitable and economical for use in the Birmingham metal trades. Manufacturers are being canvassed with a view to the adoption of the high-pressure gas, which is already being used by the department for the lighting of their works and for furnace purposes in the testing of fire-bricks. They have hardly yet considered the question of the price to be paid for the gas by the consumer in comparison with the rates for the existing supply. It may be necessary to make a slight charge to cover the cost of compressing the gas, though it is not yet certain that it will be. But even if the consumer who uses it for manufacturing purposes be required to pay a small charge additional to that now levied for low-pressure gas, he will be many times recouped by the great economies and the better results achieved by the adoption of the high-pressure gas.

NOTTINGHAM CORPORATION GAS UNDERTAKING.

The Report before the Council.

At the Meeting of the Nottingham City Council on Monday of last week, the report on the working of the gas undertaking for the past financial year (*ante*, p. 642) came up for approval.

The MAYOR (Mr. Albert Ball, J.P.), who is also Chairman of the Gas Committee, in submitting the report, remarked that it was first of all necessary to clear up some erroneous ideas that seemed to exist in the minds of some people as to the treatment of the prepayment collectors. These collectors, he explained, received a salary of £100 a year, with uniform; and up to three years ago they were taken from all sorts and descriptions of work, and taught their new duties by the Gas Committee's own employees, who did understand the job, in from four to five weeks. He was sure the Council would agree with him that a business with which a man could become adequately acquainted in four or five weeks was not a difficult one to learn. They worked from 8.30 to 1 o'clock, had an hour-and-a-half for dinner, started again at 2.30, and collected until 4.30. Then they went into the office, and were engaged in counting up their money until 6 o'clock. They had nineteen days' holiday in the year, for which they were paid; and he thought the conditions of service which he had mentioned would compare favourably with any other class that could be mentioned. In addition, the collectors were paid for all time off during sickness. During the year they put in 2170 hours, which worked out at 11d. per hour. The collectors were thus fairly paid and treated; and there was no cause for complaint. Turning to the general position of the gas undertaking, he went on to trace the cause of the increased profit made last year. In 1906, he said, when coal cost them 8s. 6d. per ton, they only made a profit of £47,364; but last year, when coal was 9s. 6d. per ton, the profit was upwards of £65,000. The price of coal therefore did not account for the extra profit made last year. It was attributable to the fact that they were now making more gas per ton of coal carbonized, and to the fact that the general condition of the undertaking was much better than it was some years ago. In 1901, they made 9675 cubic feet of gas per ton of coal carbonized; whereas to-day they were making 11,196 cubic feet—an increase of 1519 feet. In addition to this improvement, there was a great saving of gas unaccounted for. In 1901, it was 7·5 per cent. of the total make; while to-day it was 4·5 per cent. There was a saving between last year and this year of 11,500,000 cubic feet of gas unaccounted for. Substantial improvements had been made in the works; and if they were to retain the services of the Engineer, who might have obtained a better position very recently, it would be necessary to consider some increase in his salary. The reserve fund to-day stood very much higher than it had ever been in the history of the concern—namely, £128,706. Then, £21,792 had been placed to renewal account, which they were putting on one side to improve and remodel and bring up to date the Radford works; and there also was a small depreciation fund of £3500—making a total cash reserve of £153,988. He thought it would be agreed that the gas undertaking was now being managed in the best and most economical manner possible; and if those who were so ready to criticize the actions of the Gas Committee would take a little greater interest in the works, and see what was being done, they would be well satisfied. He was confident that the Committee were carrying out their duties to the best advantage.

Alderman Sir EDWARD FRASER recalled the unqualified abuse to which the management of the gas undertaking was subjected not so very long ago, when the whole city resounded with criticism; and he asked how it came about that, under the same Engineer, they had now entered into Paradise, as it were. Was it not, as the figures in the report showed, that since 1902 down to the present time there had been a steady improvement in the returns of the undertaking? The gross profit had risen from £75,000 to £110,000 over this long series of years, which was absolutely creditable to the Gas Engineer and those under his control. The improvement, he felt bound to point out, had not been sudden or spasmodic; and the return showed most conclusively to his mind that the agitation which was got up some years ago was not in the interests of the undertaking, but for extraneous purposes. He realized this at the time; and what had happened since had confirmed the view. The perusal of the figures during the period he had mentioned showed that the undertaking had become increasingly profitable—as, of course, it ought to be, with the price of gas what it was. He could not allow it to be said that all these things had come about within the last one or two years; for the figures in the report conclusively proved that, prior to the agitation and down to the present time, there had been a steady and continuous improvement in the working of the undertaking.

Dr. MILNER disagreed with some of the conclusions of the previous speaker, and declared that the gas inquiry was the best thing that had happened to the department and for the city. The improvement, it was true, had been gradual since Mr. Brown's appointment.

The MAYOR explained that the increased profits of the gas under-

taking had not been continuous since 1902, as they dropped from £97,037 in 1904 to £91,941 in 1905. As to the price of gas in Nottingham, it was below that of several other large cities. The Committee were, however, gradually bringing the charges down, beginning at the right end—the small consumers.

When the report of the Gas Committee recommending an increase of salary from £1000 to £1200 to the Gas Engineer (Mr. J. H. Brown), and that the Gas Accountant (Mr. W. Garton) should be granted £50 in recognition of his fifty years' services to the department, was to have come before the Council,

The MAYOR announced that it would be deferred until after the presentation of the report in reference to the one day's rest in seven and the minimum wage of 6d. per hour. At the same time, he said, it was not the intention of the Committee not to bring forward the report. If it was desired to have the gas undertaking managed efficiently, they would have to act as other large concerns of a similar character did, and give fair remuneration.

STAFFORD GAS AND ELECTRICITY SUPPLY.

Large Profits from Gas—Reduction in Price.

At the last Meeting of the Stafford Town Council, the report of the Gas and Electricity Committee for the past financial year was presented. They recommended that, in pursuance of the arrangement as to profit-sharing by the employees of the Gas Department, a bonus of 9·25 per cent. on the wages, compared with 6·3 and 9 per cent. in the two preceding years, be paid to the clerks and workmen in respect of the year's working; and that, in pursuance of a similar arrangement in regard to the officials and workmen of the Electricity Department, a bonus of 7·9 per cent. be paid on the wages, compared with 7 and 7·25 per cent. in the two preceding years. They further recommended that from the 30th inst. the following reductions should be made in the price of gas for lighting: (*a*) To ordinary consumers in the district from Weeping Cross to Milford from 4s. to 3s. 6d. per 1000 cubic feet, and to slot-meter consumers from 4s. 5d. to 4s. per 1000 feet; (*b*) to all other consumers, 2d. per 1000 feet.

Alderman WRIGHT said he had never appreciated bringing an annual report before the Council so much as he did on this occasion; and he thought they would approve of what the Committee had decided to do. The sales of gas had not amounted to quite so much as they did twelve months ago. They had yielded £25,587—a decrease of £24; and the residuals had produced £7092, or £275 less. The fittings department showed a profit of £356; and the hire of stoves and repairs department a profit of £47, against a deficiency of £175 before. The manufacture of gas had cost £13,950, compared with £13,947. There had not been quite so much gas made in the year just ended, and the increase was due to the cost of coal having gone up from 10s. 3d. to 10s. 7½d. per ton. The revenue was £33,595, and the expenditure totalled £18,316. The gross profit for the year was consequently £15,280—an increase of £526 upon the previous year. This he thought the Council would consider highly satisfactory. With the balance brought forward, they were left with £15,522 in hand. The charges against the net revenue account, such as repayment of loan, amounted to £7072; and this left an available balance of £8450, compared with £5660 before. Out of this balance they proposed to make a contribution of £3500 in relief of the district rate. They intended to pay £50 to the Free Library Committee as usual, for lighting expenses at the institution; £1000 would be transferred to the credit of the suspense account in respect of the carburetted water gas installation; £2507 would be added to the reserve fund; and £500 would be set aside for payment of the cost of new coal waggons. There remained a balance of £893, from which they proposed to pay a bonus to the workmen; and the working costs enabled them to make it 9·25 per cent., against 6·3 per cent. last year. This meant that the men would receive nearly 2s. in the pound in the shape of a bonus on their wages. He thought this would encourage them to take the greatest interest in their work, and to work together for the improvement of the undertaking. Another satisfactory feature was the very slight leakage. He would not be surprised to hear that their leakage during the year established a minimum for the whole country. It was only 1·07 per cent., and was the lowest on record so far as their own works were concerned. The capital had not been increased; they had not borrowed any money for years, and the total loan on the undertaking was £40,406. Thanks to its excellent management, the concern now stood at the ratio of 4s. 1d. per 1000 cubic feet of gas, whereas ten years ago it stood at 9s. 6d. To sum up the condition of things, they had to-day an undertaking which, upon the very moderate estimate of 25 years' purchase of their profits of £15,000, would work out at £375,000, while the total loans stood at £40,446. The works were valued at £34,553; and they had contributed to the rates £55,225 from the profits of the undertaking. They had paid off loans amounting to £73,437; and he considered that the record was one upon which the town had a right to feel proud. In the electricity department the sales of current, including the public lighting, amounted to £4341, against £4361 the previous year. The electric fittings showed a loss of a few pounds, against a profit of £102; and the general receipts had decreased by £128. But economies had been practised; and the result was that they had a gross profit of £2478, compared with £2465 the preceding year. They had paid their way, and had set aside the instalment of the loan; and they did not ask the ratepayers to contribute anything to the department. They proposed to pay the employees a bonus of 7·9 per cent., against 7 per cent. the previous year.

Alderman MOTTRAM, in seconding the motion, said the rates of Stafford would have been 10d. more in the pound if the gas-works had been privately owned, instead of belonging to the Corporation.

The recommendations were adopted.

The Midhurst Rural District Council have accepted a tender for gas-driven air-lift plant in connection with the water supply, at a cost of £403.

SALFORD AND ITS GAS CHARGES.

A Special Meeting of the Salford Town Council has been called for to-morrow (Wednesday) to re-consider the proposals of the Gas Committee as to a re-imposition of meter-rents, a reduction in the quantity of gas supplied for 1d. by prepayment meters, and a lessened charge for gas to consumers of over 2,000,000 cubic feet. As reported in last week's issue of the "JOURNAL," the Council rejected these recommendations—a decision which placed the Gas Committee in an awkward position, having regard to the fact that coal is costing £7200 more this year than last, and that in response to pressure by the Finance Committee an increased contribution has been promised in aid of the rates from the profits made by the Gas Department.

Last Thursday a meeting of the General Purposes Committee, presided over by the Mayor, passed the following resolution: "That, after full consideration, the General Purposes Committee approve of the proposals of the Gas Committee, and respectfully request the Council to reconsider their decision of last week." The General Purposes Committee, which embraces all the members of the Council, met in private.

The same evening Councillor Royle, addressing a meeting of ratepayers in St. Paul's Ward on the subject, said he opposed the proposed reduction of the quantity of gas supplied to penny-in-the-slot consumers from 30 to 27 cubic feet. One argument urged in favour of it, he added, was that the cost to collect from the slot-meter users was greater than the cost of collecting from quarterly consumers. His answer to this was that if it was so, then the department must be overstaffed. What was wanted was that something should be done as regarded the internal management of the department. While the Gas Committee were anxious to increase the price of gas to small consumers—because the proposal meant an increase in price—they were ready to reduce it to large consumers. A large quantity of gas was bought by people in the outside districts; and, in his opinion, the better plan would be to raise the price of the gas supplied to them. Then the Gas Committee desired to re-impose meter-rents. The only argument so far brought forward in favour of this was that a number of people used electric light and had gas-meters as a stand-by. This was no argument for making all pay.

BOLTON CORPORATION GAS DEPARTMENT.

The Annual Accounts.

The report of the Gas and Lighting Committee of the Corporation of Bolton for the year ended the 31st of March has been issued. The accounts accompanying it show that the net revenue from the sale of 933,106,000 cubic feet of gas was £114,745; residuals produced £38,163; and the total receipts were £155,201, compared with £152,877 in the preceding year. The manufacture of gas cost £83,298 (coal and cannel figuring for £55,695); distribution came to £10,183; management to £2238; the total expenditure to £105,413—leaving £49,788 to be carried to the profit and loss account. For the preceding year, the expenditure was £102,479; and the balance was £50,398. After meeting annuities and interest on loans, paying the dividend on the Corporation stock, &c., there is a net balance of £24,243, out of which the Committee have voted £20,000 in aid of the district rates, and carried the balance of £4243 to the credit of the reserve fund account, the balance of which on March 31 was £56,194. The following comparative statistics of working are given by the Committee.

	1910.		1909.
Tons of coal and cannel carbonized.	98,872	..	94,802
Average cost per ton	11s. 3d.	..	11s. 7d.
Percentage of cannel used. . . .	1·16	..	1·02
Gas made, cubic feet	986,131,000	..	970,577,000
Do. do. per ton carbonized . .	9,974	..	10,238
Gas accounted for, cubic feet per ton carbonized	9,510	..	9,700
Gas unaccounted for, per cent. . .	4·65	..	5·25
Maximum quantity of gas supplied in 24 hours during year, cubic feet .	5,471,000	..	6,047,000
Minimum quantity, do.	889,000	..	797,000

The total net capital expenditure was £687,918; being at the rate of £697 per million cubic feet of gas made, £6 19s. 2d. per ton of coal carbonized, and 14s. 9d. per 1000 cubic feet of gas sold.

LINCOLN CORPORATION GAS UNDERTAKING.

The Past Year's Working.

At the Meeting of the Lincoln City Council last Tuesday, Alderman Wallis, the Chairman of the Gas Committee, gave some particulars from the accounts of the gas undertaking for the year ended the 31st of March. He said the gross profit was £14,235, compared with £12,996 for the preceding year. After allowing for interest and sinking fund charges of £7929, the net profit was £6306—an increase of £1137. The figures relating to the gas supplied showed that the total quantity was 8½ million cubic feet more than in the previous year, following an increase of 13½ millions reported twelve months ago. He thought this was very satisfactory, considering the competition of the Electricity Committee. The total assets exceeded the liabilities by upwards of £104,000. During the year they had spent in repairing, renewing, and refixing meters £1634, of which £800 was for new meters. They had laid out another £1000 on new cookers, which had been provided out of profit, as had the meters. The Council intended to hand over to the rates £3000 out of the profits; and he was glad to say they were carrying forward a greater sum than they anticipated—£1134. They had spent £3134 on new purifiers, which were working very satisfactorily, and would not require renewing for probably 25 years. Their

liabilities amounted to £148,464; and, with the balance of assets, the total was £253,268. The concern was thoroughly up-to-date; and if the Corporation were called upon to purchase such an undertaking, they would have to give at least £300,000 for it. In conclusion, the speaker paid a high tribute to the Engineer (Mr. John Carter).

MARKET HARBOROUGH GAS UNDERTAKING.

Satisfactory Year's Working.

At the Meeting of the Market Harborough Urban District Council last Tuesday, the report of the Gas Engineer and Manager (Mr. A. T. Harris) on the working of the undertaking for the twelve months ended March 31 was presented. It furnished the following particulars.

The total receipts on revenue account were £9093, and the total expenditure was £6389; leaving a gross profit of £2704. This was £39 less than in the year 1908 9; but Mr. Harris explained that the reduction made in the price of gas a year ago had adversely affected the revenue to the extent of £330. After meeting the interest on loans and the repayment of the principal, there was left a net surplus of £612. During the year a sum of £200 was expended on new mains, meters, and stoves. Deducting this, there was a net gain of £412 in the financial position of the department. The total balance to the credit of the profit and loss account at the close of the year was £3020. Coal cost £3278; being £139 less than before, though the make of gas had increased by nearly 2 million cubic feet. This reduction was due to lower prices prevailing, and to improved working results; the make of gas being 11,800 cubic feet per ton, against 11,567 cubic feet in 1908-9. The total make of gas last year was 53,100,000 cubic feet, or an increase of 1,926,000 cubic feet; and the sale to private consumers and for public lighting was 49,208,000 cubic feet, being an increase of 2,006,000 cubic feet. The net receipts from ordinary consumers showed a decrease of £104, though the increased sales of gas through these meters amounted to 1,256,000 cubic feet—the decreased income being due to the reduction in price already referred to. Prepayment meters showed an increase of £115; leaving a net increase of £11 on the total sales. The receipts from ordinary and prepayment meters were £4792 and £1661 respectively; making a total net income from sales by consumers' meters of £6453. There was a net decrease of £39 in the receipts for residuals. Mr. Harris concluded by stating that no special outlay would be required for extensions during the current year; the plant being generally in an efficient condition. But attention would shortly have to be given to the purifiers, to which repairs had been executed several times during the past year.

Accompanying the report of Mr. Harris was that of the Gas Committee, who recommended—"That, subject to confirmation by audit, the annual report and statement of accounts be approved; that the payment of the sum of £200 expended in additions to plant during the year out of profits be approved; and that the balance of £412 be carried forward to the credit of the profit and loss account." They also instructed the Manager to prepare the necessary plans and specifications, and obtain prices for renewing and enlarging part of the purifying apparatus.

Mr. J. L. DOUGLASS, the Chairman of the Gas Committee, in moving the adoption of their report, said the year had been a very successful one, both from a financial and a general point of view. The net profits showed a diminution of £39 compared with the previous year; but the Council must take into account that the price of gas was reduced during the whole of the past year—for six months the reduction was 3d., and for the other six months 2d., per 1000 cubic feet. This had affected the profits to the extent of over £300 during the year; so that if the price had not been reduced the profits would have been £260 more than in the previous year. After allowing for repayment of principal and interest, and additions to plant, and also taking into account the £160 transferred in relief of the rates during the year, there remained a surplus of £252, which it was proposed to carry forward. For the first time since the Council had been in possession of the undertaking, surpluses of revenue had been used for providing new plant, instead of raising additional capital. The Manager told him that the whole of the plant had been maintained in a thoroughly efficient condition; and there was no doubt the undertaking was in a sounder financial position now than it had ever been. On March 31, their assets showed a surplus of £12,100 over all liabilities. They had been able to maintain their profits in spite of the reduction in the price of gas, owing largely to the facts that coal had been cheaper and that the new retorts had produced better results. He thought he ought to voice the opinion of the Committee that the Manager was much to be congratulated on the results achieved during the year.

Mr. S. GOWARD seconded the motion.

Mr. R. C. DUNKLEY said it had been his pleasure in the past to support everything that had been said with regard to the management of the gas-works; and he did so again, as he was convinced that it could not be excelled. As one outside the Gas Committee, he offered the Manager his compliments and thanks; and he also included the other officers of the Council, and particularly the Gas Committee, who, during the past year, had given their best to this work in the interests of the town. No Committee could have supported a Manager better than they had done. Their thanks were due also to the men, who gave of their bone and sinew in their service.

The report was adopted.

Public Lighting of Oswestry.—At the meeting of the Oswestry Town Council on Monday last week, the report presented by the Watch Committee contained a recommendation that the tender of the Oswestry Gas Company for the public lighting of the borough for a period of seven years from Oct. 1, 1910, should be accepted. The matter gave rise to a long discussion, as the recommendation was arrived at only on the casting vote of the Mayor. The Electric Light Company had submitted a tender which it was stated was lower than that of the Gas Company; but it did not comply with the specification. Eventually the recommendation of the Committee was adopted.

MANAGEMENT OF THE BURTON-ON-TRENT GAS-WORKS.

Assistant-Manager's Salary Increased.

At the Meeting of the Burton-on-Trent Town Council last Wednesday, a discussion took place on a recommendation contained in the report of the Gas and Electricity Committee to increase the salary of the Assistant Gas Manager (Mr. R. S. Ramsden) by £30 per annum.

Alderman Lowe, in moving the adoption of the report, said Mr. Ramsden was appointed 3½ years ago at a salary of £180 a year, with a house, coal, gas, rates, and other items. At the time the salary was agreed upon, it was a fair remuneration. But the position of the works had steadily improved, and as Mr. Ramsden had done his duty and rendered good service to the Council, he (Alderman Lowe) maintained that he was entitled to some consideration. Consequently, the Committee recommended an increase of £30. Several members felt that this amount was inadequate; but, after considerable discussion, it was fixed upon as a fair advance. Mr. Bell, their Consulting Engineer, had had an opportunity of forming an opinion of Mr. Ramsden's work; and he spoke of him in the highest terms. He described him as most attentive to his duties—never being away from the works except on business; while the works were thoroughly well looked after. Mr. Bell, in fact, thought they were not paying Mr. Ramsden the salary he was entitled to. The Council should also bear in mind that the gas-works were doing very well, and they ought to be more generous in their prosperity than in their adversity. He hoped the Council would pass the recommendation, as it was a very fair one. Alderman Roberts seconded the motion.

Mr. J. Rowland moved, as an amendment, that the paragraph in the report referring to the proposed increase in salary be deleted, and that the matter be considered twelve months hence. He thought the proposal should be referred back to the Committee until the Council found themselves with a fully-equipped gas undertaking. Alderman Lathbury seconded the amendment. Alderman Rowland thought that Mr. Ramsden was entitled to some advance; but he considered an increase of £20 per annum would meet the case, so long as Mr. Bell was retained as Consulting Engineer. He gave notice of an amendment to this effect. Mr. King suggested the adjournment of the question until the reconstruction of the gas-works had been completed, and possibly alterations made in the staff. The Mayor (Mr. T. Jenkins) said he should vote for the recommendation of the Committee, because Mr. Ramsden was worth more than his present salary and the extras; and the proposed increase would not affect the rates. Alderman Lowe, in reply, pointed out that Mr. Ramsden was really more than Assistant-Manager, and that he was all the week at the gas-works.

The Council then voted upon Mr. Rowland's amendment, which was lost by 14 votes to 12. Alderman Rowland then submitted his amendment for an increase of £20 per annum; and Alderman Lowe said he was prepared to accept it, as it appeared to meet the view of the Council. After some further remarks, the amendment was put and carried unanimously.

DEVONPORT CORPORATION GAS UNDERTAKING.

The Disposal of Municipal Profits.

From the statement of accounts submitted to the Devonport Town Council, it appears that the year ending March last was one of the most profitable in the history of the municipal gas undertaking. The sales of gas reached a total of 358,751,500 cubic feet—an increase of 15,651,200 cubic feet, or 4·5 per cent., compared with the previous year. The income from the sale of gas for private consumption and public lighting was £45,513; being £2069, or 4·76 per cent., more than before; and the gross profit amounted to £21,590, which is equivalent to 6·79 per cent. on the capital employed. From a detailed statement, it appears that the make of gas has increased from 295,929,000 cubic feet in 1903, the first year in which the Corporation had control of the undertaking, to 369,803,000 cubic feet last year; while the unaccounted-for gas has decreased in the same period from 23,031,000 cubic feet, or 7·1 per cent., to 7,760,500 cubic feet, or 2·1 per cent. The number of consumers has risen from 7923 to 16,935, of whom 10,367 are supplied through prepayment meters. There are 1055 stoves on hire. The coal and its equivalent carbonized last year amounted to 37,543 tons; the average cost, including delivery, working out at 12s. 4·47d., against 13s. 4·68d. the previous year. The make of gas per ton of coal carbonized was 9850 cubic feet, compared with 10,248 cubic feet in the year 1908-9. Of coke, there was produced 18,562 tons, which sold at an average price of 14s. 8·9d.; while tar, of which the produce was 270,627 gallons, realized 13s. 3·37d. per ton, and sulphate of ammonia (238 tons) made only £6 6s. 1·94d. per ton. From the gross profit, £18,115 had to be deducted for interest and repayment of loans; leaving £3475 to be carried to the reserve fund.

Alderman TOZER, the Chairman of the Gas Committee, said it was satisfactory to find that they had such a sum as £3475 to add to the reserve fund. The Committee were not able to reduce the price of gas or to make any contribution to the rates, as the whole of the profit had been swallowed up in meeting expenditure outside the ordinary payments. In the past year, the manufacture of gas had cost 1¾d. per 1000 cubic feet less than in the year 1908-9. The sales had increased by 90 million cubic feet between 1903 and 1910, notwithstanding the fact that between these years the supply to Government establishments had fallen off to the extent of 30 millions. This was accounted for by the augmentation of the automatic installations, and by the use of 35 million cubic feet of gas for public lighting. The increase in the sale of gas last year was a record, except for 1904, the first year the Corporation had control of the works.

Mr. DAYMOND moved that the report be referred back to the Committee with a view to the appropriation of a portion of the profits for the relief of the rates.

A similar motion had previously been made with reference to the accounts of the Electricity Committee. In the course of the discussion on this question, the Town Clerk had remarked that the subject of

allocating net profits to the relief of the rates or to a reduction in the price of the commodity was one which demanded careful consideration; but there were certain features which made it expedient not to deal with the matter in the open Council. He suggested that the Council should meet in Committee for the discussion of the subject, when he thought they would receive a large amount of enlightenment.

Mr. MOON supported the proposal to refer the Gas Committee's report back, and expressed the opinion that it was quite time the ratepayers received some benefit from the undertaking.

Mr. COUSINS explained that a large expenditure was being incurred in renewing mains which had become defective through age, and contended that the time was not opportune to talk of appropriating the reserve fund for the reduction of the rates.

Alderman TOZER said they had overspent their capital, and now had to pay for work out of current revenue. In the past year they had incurred expenditure to meet deficiencies, some of which had existed for eight years. Although they had a net profit of £3474 to add to the reserve fund, the fact was that the balance in hand on the fund was now £200 less than last year. When the time arrived, no one would be more pleased than he to see contributions made to the relief of the rates.

The report was adopted.

TEIGNMOUTH GAS SUPPLY.

Improved Results.

At the Meeting of the Teignmouth Urban District Council last Tuesday, a statement for the year ended March 31, prepared by the Gas Engineer and Manager (Mr. J. A. Gray), was presented. It showed a gross profit of £2127, of which £1100 had been required for repayment of loans, while a further £558 was absorbed by interest. A balance of £469 remained to be added to the net revenue account, increasing it to £2780. At March 31, 1903, there was a deficit of £1283 on revenue account; so that financial improvement to the extent of £4063 had been effected in seven years, while the output of gas had increased by 75 per cent. At March, 1902, the debt on the gas-works amounted to £16,319; and at March last to £16,136. As the sales increased, the more hopeful became the prospect for cheaper gas. The quantity sold to private consumers was 29,335,900 cubic feet—an increase of 5·7 per cent. Slot-meter consumers accounted for 4,287,600 cubic feet—being an increase of 15·2 per cent. over the year 1908-9; 5,725,000 cubic feet were estimated to have been consumed by the public lamps, and about 800,000 cubic feet were used at the works. In January last, the erection was completed of new purifiers of ample area, displacing plant which had done duty for 41 years. An all-round reduction of 3d. per 1000 cubic feet in the price of gas was made at the commencement of the second half of the financial year; also a reduction at the rate of £160 per annum—the equivalent of a rate of 1d. in the pound—on the charges for public lighting. Successive reductions to a total amount of 1s. 4d. per 1000 cubic feet had been made in nine years; and the public lighting charges had also been repeatedly reduced, to the advantage of the district rates. Mr. Turpin, alluding to a recommendation of the Gas Committee to apply for sanction to a loan of £1000 for the provision of slot-meters and stoves, urged the necessity of not adding to the indebtedness of the town. He said that they were now getting into a healthy financial condition in regard to the gas-works, and they should not go in for borrowing. He proposed that the matter be referred to the Gas Committee to consider the question of paying for these things out of current revenue. It was pointed out that the Council need not take up all the £1000. The proposition, however, was carried; and the matter was referred back to the Committee.

COVENTRY CORPORATION TRADING DEPARTMENTS.

Lecture by Mr. F. W. Stevenson.

Some interesting information concerning the trading departments of the Coventry Corporation was imparted by Mr. Fletcher W. Stevenson, the Engineer and General Manager of the gas undertaking, in one of a series of "Citizenship" addresses lately delivered by him to a gathering of Coventry citizens, under the presidency of Mr. W. H. Batchelor, the Chairman of the Gas Committee. Mr. Stevenson's remarks were based upon "The Citizen as Trader." He observed that there were three trading departments of the Corporation that regularly made contributions in aid of rates—the gas, water, and electricity undertakings. During the last ten years, the amount contributed by the Water Department had been £34,500, and by the Gas Department £17,000; while the Electric Light Department had contributed £3850 in the last four years. The contributions in aid of the rates from the gas and electricity concerns were always justified on account, it was said, of the risk incurred. With regard to the electric light, it had been necessary to draw upon the rates to make up deficiencies to the amount of something like £12,000 in past years; but now that this was a flourishing concern, it must pay back this debt with interest, just as any private trader would have to do. There, however, its obligation ceased. But the gas had never needed a penny from the rates. The gas consumers had made all the profits, and were entitled to them, subject only to proper provisions for renewals, depreciation, and reserves. Very many were probably consumers of gas through prepayment meters, and therefore paid at a higher rate for the gas; and it was much more important to them to have the price reduced than to have a penny or two in the pound less on the rates. The gas undertaking was purchased from the Gas Company in 1884. It was comparatively a small concern, supplying about 184 million cubic feet of gas a year, and charging an average price of 3s. per 1000 cubic feet. Now it supplied nearly 800 million cubic feet a year, and the price had fallen to an average of 2s. 3d. per 1000 cubic feet. It was growing more rapidly than ever; and with the increased growth there was no doubt the price would go steadily down. It was astonishing to note the ever-widening field for the uses of both gas and electricity in providing light, heat, and power. It was only about thirty years ago that electricity first entered the field for lighting and power; and it was then prophesied that coal gas was doomed, and that the new illuminant would hold unrivalled sway. But Baron von Welsbach invented the incandescent mantle, and the so-called doomed illuminant sprang into fresh life, and was to-day more generally used than ever. At the same

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 680.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,474,000	Stk.	Apl 1	5	Alliance & Dublin Ord.	82—84	..	5 19 1	4,940,000	Stk.	May 12	8	Imperial Continental	177—179	..	4 9 5
310,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	100—102	..	3 18 5	1,235,000	Stk.	Feb 10	3½	Do. 3½ p.c. Deb. Red.	94—96	..	3 12 11
200,000	5	May 12	7	Bombay, Ltd.	6⅛—6⅜	..	5 9 10	195,242	Stk.	Mar. 16	6	Lea Bridge Ord. 5 p.c.	122—124	..	4 16 9
40,000	5		/	Do. New, £4 paid	4⅜—5⅛	..	5 9 3	561,000	Stk	Feb. 25	10	Liverpool United A	219—221	−3	4 10 6
50,000	10	Feb. 25	15	Bourne- mouth Gas and Water } B 7 p.c. Pref. 6 p.c.	29—30	..	5 0 0	718,100	,,	,,	7	Do. B	163¾—165½		4 4 7
311,810	10	,,	7		16¼—16⅝	..	4 3 7	306,083	,,	Dec. 29	4	Do. Deb. Stk.	104—106	+1	3 15 6
75,000	10	,,	6		15—15½	..	3 17 5	75,000	5	Nov. 26	6	Malta & Mediterranean	4½—5	..	6 0 0
380,000	Stk.	,,	12½	Brentford Consolidated	251—254	..	4 18 5	560,000	100	Apl. 1	5	Met. of } 5 p.c. Deb	100—102	..	4 18 0
300,000	,,		9⅜	Do. New	188—190	..	5 0 0	250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	100—102	..	4 8 3
50,000	,,	Aug. 12	5	Do. 5 p.c. Pref.	120—122	..	4 2 0	541,920	20	May 27	3½	Monte Video, Ltd.	12⅛—13	..	5 7 8
206,250	,,	June 10	4	Do. 4 p.c. Deb.	99—101*	..	4 19 3	1,775,892	Stk.	Feb. 2	4½	Newc'tle & G'tesh'd Con	102⅜—103⅛	— 2	4 9 4
220,000	Stk.	Mar 16	11	Brighton & Hove Orig.	213—216	..	5 1 0	529,435	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	91—93	..	3 15 3
246,320	,,		8	Do. A Ord. Stk.	152—155	..	5 3 3	55,940	10	Feb. 25	7	North Middlesex 7 p.c.	13½—13⅝	..	5 1 10
460,000	23	Apl. 1	16⅝	British	44—45	..	4 14 8	300,000	Stk.	Apl. 29	8	Oriental, Ltd.	138—140	..	5 14 4
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c.	118—120		5 0 0	60,000	5	Apl. 1	8	Ottoman, Ltd.	6—6¼	..	6 8 0
165,700	,,	,,	4⅜	Do. B 3½ p.c.	88—90	..	5 0 0	31,800	53	Feb. 25	13	Portsea Island A	134—136	..	5 1 0
82,278	,,	,,	5⅜	Do. C 5 p.c.	105—107	..	5 2 10	60,000	50	,,	13	Do. B,	126—128	..	5 1 7
55,000	,,	Dec. 29	3⅜	Do. 3½ p.c. Deb.	87—89	..	3 18 8	100,000	50	,,	12	Do. C.	119—121	..	4 19 2
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	—	..	—	114,800	50	,,	10	Do. D and E.	100—102	..	4 18 0
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	98—100	..	4 0 0	398,490	5	Apl. 29	7	Primitiva Ord.	7¼—7½	..	4 13 4
100,000	10	—	—	Cape Town & Dis., Ltd.	4—5		—	796,980	5	Jan. 27	5	Do. 5 p.c. Pref.	5¼—5⅝	..	4 10 11
100,000	10	—	—	Do. 4½ p.c. Pref.	5⅜—6⅛	.	—	488,900	100	June 1	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	49—50	..	6 0 0	1,000,000	10	Oct 14	8	River Plate Ord.	—	..	—
100,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	89—91	..	4 18 11	312,650	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	99—101	..	3 19 3
157,150	Stk.	Feb. 25	5	Chester 5 p.c. Ord.	109—111	..	4 10 1	250,000	10	Apl 1	9	San Paulo, Ltd.	15½—15⅝	..	5 14 3
1,513,280	Stk.	Feb. 25	5⅜	Commercial 4 p.c. Stk.	107—109	+1	4 15 5	62,500	10	,,	6	Do. 6 p.c. Pref.	11½—12½	..	4 18 0
560,000	,,	,,	5	Do. 3½ p.c. do.	103—105	..	4 15 3	125,000	50	Jan. 3	5	Do. 5 p.c. Deb.	50⅜—51⅜	..	4 17 1
475,000	,,	Dec. 29	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3	135,000	Stk.	Mch. 16	10	Sheffield A	232—234	..	4 5 5
800 000	Stk.	June 10	5	Continental Union, Ltd.	96—98*	+⅛	5 2 0	209,984	,,	,,	10	Do. B	232—234	..	4 5 5
200,000	,,		7	Do. 7 p.c. Pref.	135—137*	+⅛	5 2 2	523,500	,,	,,	10	Do. C	232—234	..	4 5 5
492,270	Stk.	—	5⅛	Derby Con. Stk.	121—123	..	4 9 5	70,000	10	May 27	7	South African	11½—11⅝	..	5 19 2
55,000	,,	—	4	Do. Deb. Stk.	104—105	..	3 16 2	6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	120—122	..	4 9 7
148,995	,,	Apl. 1	5	East Hull 5 p.c. Ord.	96—98	..	5 2 0	1,895,445	,,	Jan. 13	3	Do. 3 p.c. Deb.	80—82	..	3 13 2
486,090	10	Jan. 27	12	European, Ltd.	24½—24⅝	..	4 17 0	209,820	Stk.	Mar. 16	8	South Shields Con. Stk.	157—158	..	5 1 3
354,060	10		12	Do. £7 10s. paid.	18½—18⅝	..	4 16 0	605,000	Stk.	Feb. 25	5⅜	S'th Suburb'n Ord. 5 p.c.	121—123	..	4 12 0
16,198,673	Stk.	Feb. 10	4⅜	Gas } 4 p.c. Ord.	103½—104⅜	..	4 9 3	60,000	,,	,,	5	Do. 5 p.c. Pref.	121—123	..	4 1 4
2,600,000	,,	,,	3⅜	light } 3½ p.c. max.	88—90	..	3 17 9	117,058	,,	Jan. 13	5	Do. 5 p.c. Deb. Stk.	122—124	..	4 0 8
4,062,235	,,	,,	4	and } 4 p.c. Con. Pref.	104—106	..	3 15 6	502,310	Stk.	May 12	5	Southampton Ord.	110—112	..	4 9 3
4,531,706	,,	Dec. 29	3	Coke } 3 p.c. Con. Deb.	81—83	..	3 12 3	120,000	Stk.	Feb. 10	6¼	Tottenham } A 5 p.c.	133—135	..	5 1 9
258,740	Stk.	Mar. 16	5	Hastings & St. L. 3½ p.c.	93—95	..	5 5 3	453,940	,,	,,	5⅜	and } B 3½ p.c.	113—115	..	4 13 6
82,500	,,	,,	6⅜	Do. do. 5 p.c.	117—119	..	5 9 3	149,470	,,	Dec. 29	4	Edmonton } 4 p.c. Deb.	59—101	..	3 19 3
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	17—17⅛	..	6 5 9	182,380	10	June 10	8	Tuscan, Ltd.	9—9⅛*	..	8 8 6
131,070	Stk.	Mar. 16	7	Ilford A and C	145—147	..	4 15 3	149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
65,789	,,	,,	5⅜	Do. B	105—110	..	5 0 0	236,476	Stk.	Feb. 25	5	Tynemouth, 5 p c max.	113—115	..	4 0 11
65,500	,,	Dec. 29	4	Do. 4 p.c. Deb.	100—102	..	3 18 5	255,636	Stk.	Feb. 25	6⅜	Wands- } B 3½ p.c.	139—141	..	4 14 0
								79,416	,,	Dec. 29	3	worth } 3 p.c. Deb. Stk.	74—76	..	3 18 11

Prices marked * are "Ex div."

time electricity had developed, and its usefulness had increased side by side with the growth of the gas industry. They had a striking instance of this in Coventry. For the financial year just closed, the sale of electric current increased by upwards of 30 per cent, and the sale of gas by about 10 per cent.; and record surplus profits had been made by both departments.

GAS SUPPLY IN THE WOLSTANTON DISTRICT.

The accounts of the Gas Department of the Wolstanton United Urban District Council for the year ended the 31st of March have been issued by the Gas Committee. They show that the revenue was £11,304, and the expenditure £6557; leaving £4747 to go to the profit and loss account, the total of which at the end of the financial year, with the amount carried forward, was £4897. After repayment of loans and interest, there was a net profit on the year's working of £303; being at the rate of 1s. 1·028d. per ton of coal carbonized and 1·163d. per 1000 cubic feet of gas accounted for. Under the supervision of the Engineer and Manager (Mr. A. A. T. Botteley), 5584 tons of coal were carbonized and 68,440,000 cubic feet of gas made; being at the rate of 12,255 cubic feet per ton. The total quantity of gas sold to ordinary consumers was 30,654,000 cubic feet, to prepayment consumers 21,433,100 cubic feet, and for public lighting 9,867,700 cubic feet. The coke made per ton of coal was 13·6 cwt.; and 12·8 gallons of tar and 25·1 lbs. of sulphate of ammonia were produced. The average receipts per ton from coke were 9s.; from tar, 19s. 5d.; and from sulphate of ammonia, £11 1s. 11d.

EXPERIMENTAL LIGHTING IN THE CITY OF LONDON.

By the time these lines appear in print, the first portion of the experimental high-pressure gas lighting in the City of London, in connection with the recommendation of the Court of Common Council, will be in operation. The work of installing the lighting has been in hand by the Gaslight and Coke Company during this past fortnight. The thoroughfare dealt with is New Bridge Street, from Ludgate Circus to Blackfriars Bridge. The lamps, six in number (in addition to a small "traffic lamp" on a refuge), are erected on columns on the footpath, without lowering gear, suspended from "swan-necks." The illuminating power of the lamps, which are of the Keith (new pattern) Fleet Street type, is 1500 candles each. They will work at 54 inches (minimum) water pressure; and as they are connected to the two compressing-houses of the Company in Tudor Street and Essex Street, all risk of failure is avoided. This lighting taking place concurrently with the trial lamps of 3000-candle power in Aldwych for the City of Westminster, some particulars in regard to which are given elsewhere, will afford the members of the Institution of Gas Engineers who are in London this week from all parts of the country an opportunity of witnessing a display of the latest types of high-pressure gas lighting in the public thoroughfares.

LYTTELTON (N.Z.) GAS AND WATER SUPPLY.

We have received the report made by Mr. G. A. Lewin, the Town Clerk of Lyttelton (N.Z.), to the Mayor and Corporation, on the municipal work of the year ended the 31st of March. In the course of it, he furnishes the following particulars as to the gas and water supply.

Mr. Lewin says a good, solid year's progress may safely be credited to the Gas Department. The sales by meter increased from 9,263,000 cubic feet at March, 1909, to 10,543,800 cubic feet at March, 1910—an advance of 1,280,800 cubic feet, or 13·8 per cent. The demand for new services kept up, and necessitated the expenditure of slightly over £400 in the plant account, which is regarded as profit spent on extensions, and is practically equivalent to writing-down the capital account by that amount for depreciation. The year just closed was the first complete one of the substantial reduction made in the price of gas for lighting purposes; and this fact is reflected in the gross revenue from gas sales on the basis of 1000 cubic feet sold. Last year the average was 77·28d., while this year the figure is down to 76d. On the other hand, both coke and tar sales show a slight increase in the returns per 1000 cubic feet. The make per ton of coal shows a slight decline, compared with last year's figures, due to the somewhat inferior quality of the coal available, owing to threatened trouble in the coal trade generally as a reflex of the Newcastle strike. The net cost of coal per 1000 cubic feet sold again shows a slight decline, which, in view of the foregoing disabilities, Mr. Lewin thinks must be counted as satisfactory. The figures this year work out at 2·64d., against 2·95d. last year.

The following are some of the statistics submitted by Mr. Lewin: Receipts, £4423; expenditure, £4142; net profit, £1163; coal carbonized, 984 tons; gas made, 11,278,800 cubic feet, or 11,462 cubic feet per ton of coal; coke sold, 374·5 tons, or 7 61 cwt. per ton; tar made, 12,025 gallons, or 12·22 gallons per ton; net cost of coal per 1000 cubic feet of gas sold, 2·64d. Of the total make of gas, 39·5 per cent. was sold by meter for lighting, 44·77 per cent. by meter for special purposes, 9·22 per cent. for public lighting, 3·68 per cent. was used on the works, and 2 83 per cent. was unaccounted for. From Dec. 1, 1902 (the date of the transfer of the undertaking to the Corporation), to March 31, 1910, the total sum earned was £25,741; and the total payments were £19,149—showing a net profit of £6592, of which £2974 has been expended on new works and extensions, £500 has been transferred to the general account in relief of the rates, and there is a cash credit of £1013.

Reporting upon the water supply, Mr. Lewin gives figures showing

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246.

that the total quantity of water pumped in the period reported upon was 65,462,000 gallons, compared with 59,737,000 gallons in the preceding year; the town consumption being 57,133,750 gallons, against 50,570,300 gallons. The daily consumption per head varied from 33·18 gallons in June to 46·2 gallons in December—the average being 39·15 gallons, compared with 34·65 gallons in 1908-9. Mr. Lewin says the first complete year with the new plant—producer-gas engines and high-lift turbine pumps—at the Heathcote Valley pumping-station, the installation of which was referred to in the last report, has demonstrated its advantages. The cost of pumping has been reduced, if not as much as the first two or three months' work seemed to suggest, still to an extent which more than pays the interest on the whole of the expenditure. In 1908, the last complete year with the old steam outfit, there were pumped 56 million gallons of water to the main reservoir, at a fuel cost of £381, or £6 16s. per million gallons. On this basis, the cost of fuel to raise last year's 66½ million gallons would have been £449, whereas by means of the new plant the work was done at a fuel cost of £175, or a saving of £274. Some little difficulty was at times experienced in starting the engines; and with the view of overcoming this trouble a compressed air-starting outfit has been installed. It consists of a little oil-engine driving a compressor, by means of which compressed air is stored in a steel reservoir. Mr. Lewin says the plant works admirably, and is now doing all that was foretold of it.

POOLE CORPORATION WATER SUPPLY.

The New Works.

In the last number of the "JOURNAL" (p. 649), reference was made to the opening of the new water-works which have been constructed for the supply of Poole, in accordance with the plans of Mr. W. Matthews, M.Inst.C.E., the Consulting Water Engineer to the Corporation. The following are some additional particulars respecting the scheme.

Following the amalgamation in 1906 of Branksome with Poole, the feeling grew that the water supply for the borough should be in the hands of the Corporation. It had, for half-a-century, been vested in a Company, who had under consideration the promotion of an extension scheme costing about £40,000. The matter was referred to arbitration; and the purchase price of the undertaking was fixed at £134,000. The Corporation then had to take into consideration the other part of the Act, under which they had obtained powers for extension; and the services of Mr. Matthews were secured.

The new scheme consists of a well and pumping-station at Corfe Mullen, in the valley of the Stour, about midway between Wimborne and Bailey Gate, and a line of pipes through which the water is pumped to a new service reservoir at Forest Hill. From this high-level reservoir the water flows by gravitation through lines of pipes to the new service reservoirs at Lytchett and Constitution Hill, and also to the existing service reservoir at Broadstone and the water-tower at Parkstone. The existing tower at Broadstone, being at a higher level than the Forest Hill reservoir, cannot be supplied direct, and it has been necessary to provide a small pumping plant in the base of the tower, which, working for perhaps a few hours twice a week, lifts the required quantity of water from the Broadstone reservoir into the tower above it.

The well was commenced on June 27, 1907, and it and the headings were completed on July 11, 1908. Galleries or headings of a total length of 435 feet have been driven into the chalk at a depth of 160 feet from the surface. The well proper yielded 30,000 gallons of water per hour, and the driving of the galleries added another 10,000 gallons per hour, until, with little warning, a fissure was struck, which yielded so much water that the Contractors' pumps were overpowered, and the men had to be withdrawn hastily from the workings, which have since remained flooded. The yield of this well cannot be less than 2 million gallons a day; and while the quantity to be pumped remains under a million gallons a day, the water will be maintained at such a high level as considerably to diminish the power required to lift it, and so reduce the fuel consumption.

The pumping-station, built over and around the well, is of brickwork, with white brick facings and red terra-cotta and Portland stone ornamentations. It comprises an engine-room, in which are assembled the whole of the main pumping machinery and gas-engines, and a producer house, in which are the gas generators, scrubbers, and circulating tanks, with coal-store adjoining. Subsidiary to these are a small engine-room for the compressed air starting gear and the petrol gas producer for lighting the building, a workshop, store, and smithy.

As mentioned last week, the new works have been designed to provide for a supply 25 years hence to an estimated population of about 54,000 persons, when, upon the present basis, the average quantity required will be about 864,000 gallons per day, and the maximum quantity 1,350,000 gallons.

NOTTINGHAM CORPORATION WATER DEPARTMENT.

The Past Year's Working.

The annual report of the Water Committee of the Nottingham Corporation has been presented. It shows that the total capital expenditure on the water undertaking up to March 31 was £1,335,067; a sum of £8078 having been added during the year. The balance carried to the net revenue account is £71,360. This account shows that £23,139 was paid on the water annuities, £22,352 as interest on consolidated stock, and other payments made up a total of £57,000; this, deducted from the £71,360, leaves £14,360 net profit, which has been transferred to the reserve fund for depreciation, renewals, and the Derwent water scheme. The net profit is higher than it has been for some years previously. No part of it is taken for the relief of the rates. The total

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quantity of water pumped from all the works during the year amounted to 2,764,047,103 gallons. The fluctuation in the consumption is shown by the fact that the maximum weekly quantity of water pumped during the summer amounted to 61,573,866 gallons, whereas during the winter it was 55,794,853 gallons. The average for the year was 53,154,752 gallons, or 7,593,536 gallons a day. The total storage capacity of the various reservoirs is only 13,845,058 gallons, or not quite two days' average requirement. During the year there was a net increase of 4318 supplies, and the total at present is 127,628 domestic and 14,481 trade, together 142,109. The total number of meters in use by the department is 3741; but in accordance with the Committee's decision to abandon the system of supplying water by meter in cases where experience has shown that the annual cost of the water consumed does not equal the meter-rent, arrangements have been made to remove such meters at the cost of the department, and to reduce the charges by 25 per cent. on the present minimum charge by meter. The system will be gradually extended wherever it is found desirable to do so. The population supplied by the Water Department at the present time is 360,769, exclusive of the outlying parishes, which are supplied in bulk through meters. The only matter now causing the Committee anxiety is the fact that colliery workings are rapidly approaching the pumping-stations at Basford, Bestwood, and Papplewick, and the reservoirs at Red Hill and Papplewick. Arrangements are being made with the coal-owners and colliery proprietors for the purpose of minimizing risk of injury or damage.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The meeting of the Waverley Association of Gas Managers in Edinburgh yesterday must be looked upon as a success, from the technical point of view, though, it must be admitted, there was disappointment in the matter of the number present and in the amount of work which was got out of those who did attend. On the latter point, it will be observed that by far the greater part of the speaking in the discussion upon oxide purification was contributed by gentlemen who are not gas managers within the Waverley district. This circumstance being brought under notice, there may be improvement in this respect in the years to come. There was remarkable unanimity of belief that oxide, and oxide only, is the material which should be used for purifying coal gas. Opinions change with the times. It is not many years since oxide was looked upon with much disfavour by many gas managers in Scotland, who could not get away from the view that lime was the only substance which could be relied upon to effectually remove all impurities from gas. I do not question that there are good reasons for the change of opinions. For one thing, the fact that gas examination is less strict now than it used to be makes oxide, or any material which might not require frequent changing, preferable to lime. But if there is anything which should recommend oxide, it ought to be found in the method which is being wrought by Mr. D. Vass, of Airdrie, whereby the oxide is revivified without being taken out of the boxes. If gas managers come to realize that such a consummation can be attained, with no expense attending the process, a very great deal will have been done to establish the claims made on behalf of oxide as a purifying material.

In the Carnoustie Town Council on Monday, ex-Provost Soutar reported that the gas-works were taken over on May 16, and the price of £21,000 was paid the same day. In addition to this, there was a sum due for gas in the holders and gas not yet charged for, as well as accounts outstanding, besides stocks in the works. Mr. A. Yuill, of Dundee, who had been employed to value these for both parties, had given his valuation, which, including half of his fee, amounted to £800 6s. 7d. He moved that this be paid. Of the sum, however, he explained, £688 was for gas, residual products, hire of stoves, &c., which were being charged out now, and this amount would come back to the Councilal most immediately. Only £112 had to be paid for the actual stock of piping, coal, meters, &c., which was a smaller amount than had been anticipated. Everything was going on very satisfactorily at the gas-works, and, as previously stated, it was the desire of the Town Council to keep in view the fact that, by the decision to discontinue charging meter-rents, they were granting a concession to ordinary meter consumers without giving any concession to prepayment meter consumers. As was previously indicated, it was the intention of the Town Council, as soon as they ascertained the proper data to go upon, to charge only the extra rate for prepayment meters necessary to cover the actual difference in the cost of working the one system as against the other. It was agreed that the Council should inspect the gas-works, and formally take them over, on Monday, the 20th inst. The Council entered into contracts for 2300 tons of coal for the current year at an average price of 14s. 7½d. per ton.

At the annual meeting of the Inverurie Gas Company on Thursday, Colonel Jackson, who presided, said that although the profit for the year was less by £58 than that of the preceding year, it was still sufficient to enable them to pay a dividend of 6½ per cent.

The Leven and Methil Gas Company are paying a dividend of 7½ per cent. The Directors have contracted for the erection of a new gas-holder.

The annual meeting of the Cambuslang Gas Company, Limited, was held on Wednesday. It was reported that the profit for the year was £2782. The Directors recommended that £1620 be set apart for payment of a dividend of 6 per cent., which, with an interim dividend of 4 per cent. already paid, made 10 per cent. for the year; that £550 be set apart for depreciation, and £200 to the reserve; leaving £412 to be carried forward. This was agreed to.

The Keith Gaslight Company have reduced the price of gas from 5s. 10d. to 5s. 5d. per 1000 cubic feet, with 5 per cent. discount to the larger consumers.

On behalf of the Gas Committee of the Sanquhar Town Council, Bailie M'Math reported to the Council at their meeting last week that

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the total make of gas from the 1st of May, 1909, to the 15th of May, 1910, was 2,788,200 cubic feet, and the quantity sold, 2,082,085 cubic feet. Unaccounted-for gas, amounting to 20½ per cent., was considerably less than in the year before. The quantity of coal carbonized was 376 tons—making the yield of gas 7160 cubic feet per ton. The wages of the Gas Manager were advanced 5s. per week.

The Gas Manager at Newport (Fife), in his annual report to the Council, states that there was an increase in the quantity of gas made last year of 1,376,900 cubic feet, and a saving of £21 upon the carriage of coal.

A new water supply for the western district of Fifeshire is in process of being brought into use, the water for which is derived from a large new reservoir at Glenquey, in the Ochil Hills. The construction of this reservoir gave a great deal of trouble, on account of the difficulty of obtaining a suitable foundation for the embankment. The cost of the reservoir amounted to more than £100,000. This week the subsidence of a small portion of the embankment, about 6 feet in diameter and 5 or 6 feet in depth, has been discovered; and as there is more than 200 million gallons of water in the reservoir, the incident has given rise to a great deal of anxiety. Mr. Parker, C.E., of Glasgow, who was latterly responsible for the construction of the reservoir, has been called in to advise as to what is to be done.

Following upon the rejection by Parliament of the Avon water supply scheme for Aberdeen, there have been frequent meetings of parties for and parties against the scheme to consider the situation. The subject was before the Town Council on Monday, when, by the casting vote of Lord Provost Wilson, after a protracted discussion, it was remitted to a Committee to prepare and submit a scheme for the taking of a water supply—first instalment 12 million gallons and second instalment 8 million gallons daily, the same as was provided for in the Avon scheme—from the River Dee; the scheme to include the construction of works capable of providing a supply of pure water. The proposal, which was not adopted, was a remit to consider and report as to an improvement and extension of the present water supply. This proposal would have covered the re-introduction of the Avon scheme. This scheme was the favourite one of Lord Provost Wilson. The opposition to the Avon scheme was chiefly based upon the argument that the present water supply from the Dee could be improved. The fact that Lord Provost Wilson gave his casting vote in favour of the proposal of his former opponents would seem to point in the direction of there being no likelihood, in the near future, of the Avon scheme being revived.

The accounts of the Dundee Corporation Water Department for the past twelve months show that while they opened with a debit balance of £1866, they closed with a credit balance of £942. The total income was £59,355. From the domestic rate, at 9d. per £1, there was realized £18,589; from the public rate, £4845; and from special rates, £35,390. The expenditure of £58,413 included £14,315 for annuities; £17,948 for interest; £9145 for maintenance and management; £5822 for rates and taxes; £8504 for sinking fund; and £500 for reconstruction work at Stobsmuir. The borrowing powers of the Department amount to £1,059,245, of which powers to the extent of £52,720 are unexercised. It is anticipated that there will not be any change in the rates this year.

The Corporation of Port Glasgow on Thursday paid their annual visit to the water-works; and advantage was taken of the opportunity to formally open a new storage reservoir and other extensions at Harelaw. The opening ceremony was performed by Provost Fyfe and ex-Provost Campbell, the Convener of the Water Committee. The new reservoir, with a surface area of 11 acres, will hold 26½ million gallons of water. The cost of construction has been £13,000.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *June* 11.

Sulphate of Ammonia.

There has been a good inquiry throughout the week, and all available supplies have been readily taken up at full prices, while in some instances an advance of 1s. 3d. per ton has been scored for immediate delivery. The closing quotations are £11 16s. 3d. to £11 17s. 6d. per ton f.o.b. Hull, £11 17s. 6d. to £11 18s. 9d. per ton f.o.b. Liverpool, and £11 18s. 9d. to £12 per ton f.o.b. Leith. More interest has been shown in the forward position; and it is reported that £11 17s. 6d. per ton f.o.b. Leith has been paid for delivery up to the end of this year. Makers have now advanced their price at that port for July-December to £12 per ton, but no transactions have transpired at the higher figure.

Nitrate of Soda.

The market for this article has become rather dull, and values are barely maintained at 9s. 6d. per cwt. for ordinary and 9s. 9d. for refined quality, on spot.

LONDON, *June* 13.

Tar Products.

The markets for tar products have been firm throughout the past week. Pitch has been rather easier; and owing to the sales of Continental pitch on the Continent, it has been very difficult indeed to get buyers to make offers for forward delivery. They appear to be willing to wait and take their chance when they are really buyers. Creosote remains steady, and makers are firm in their ideas of price on this side. It is reported that foreign contracts are being taken at lower figures. In crude carbolic acid, business is still impossible. Solvent naphtha continues steady.

The average values during the week were: **Tar**, 17s. 9d. to 21s. 9d., *ex* works. **Pitch**, London, 40s. to 40s. 6d.; east coast, 38s. 6d. to 39s. 6d., west coast, 37s. 6d. to 38s. 6d. f.a.s. Mersey ports. **Benzol**, 90 per cent., casks included, London, 8d. to 8½d.; North, 8d.; 50-90 per cent., casks included, London and North, 9d. **Toluol**, casks included, London, 10½d.; North, 10d. to 10½d. **Crude naphtha, in bulk**, London, 4½d. to 4⅝d.; North, 4d. to 4¼d.; **solvent naphtha**, casks included, London, 1s. 3½d. to 1s. 4d.; North, 1s. 4d. to 1s. 6d.; **heavy naphtha**,

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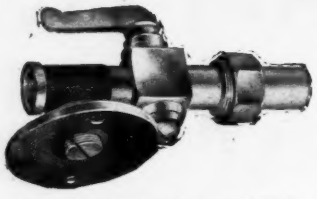
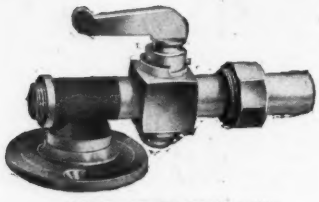


USED AS STRAIGHT-WAY TAP.



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Sulphate of Ammonia.

This market is quiet, and buyers in nearly all cases expect to purchase at a little under current prices. Actual Beckton is quoted at £11 17s. 6d., and outside makes upon Beckton terms £11 10s. In Hull, £11 13s. 9d. to £11 15s. is asked; and in Liverpool, £11 15s. to £11 17s. 6d. In Middlesbrough, £11 13s. 9d. to £11 15s. is quoted.

COAL TRADE REPORTS.

Northern Coal Trade.

There is now rather less activity in the coal trade. Prices show the summer ease, and also the effect of the diversion of some contracts at the time of the stoppages here—the delivery under which would have been now taking place. Best Northumbrian steam coals are quiet, and the price is about 10s. 7½d. to 10s. 10d. per ton f.o.b. Second-class steams are from 9s. 6d. to 9s. 9d.; and steam smalls are also rather more dull at from 5s. 9d. to 7s. There is a moderate export at present; and this is the cause of the quietness in the steam coal trade. In gas coals, Durham qualities vary in price from 9s. 7½d. to 10s. 2d. per ton f.o.b. for the usual classes; and up to 10s. 7½d. for "Wear specials." The local demand for gas coals is now just about at its lowest point in the season. But the foreign shipments are fair; and there are a number of small contracts being settled, especially to some of the Mediterranean ports. A sale of 60,000 tons, for delivery over a year, is reported, at the price of 17s. per ton at Genoa; and another of about 40,000 tons for Dublin, at near 9s. 10d. per ton f.o.b., is also named, while others are in treaty. Coke is steady, with good gas coke in moderate supply at about 13s. per ton f.o.b.

Scotch Coal Trade.

There is little change in the market. The demand for shipment coal is slightly better; but orders are still keenly competed for. Steam coal is very plentiful, and prices are easy. Splint is in better request. The prices now quoted are: Ell, 9s. 3d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 10s. to 10s. 3d.; and steam, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 359,408 tons—an increase of 35,446 tons upon the preceding week, and of 19,101 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,626,678 tons—an increase of 685,763 tons upon the corresponding period.

Kirkby-in-Ashfield Water-Works Extensions.—At a Local Government Board inquiry held last Thursday by Mr. E. A. Sandford Fawcett, M.Inst.C.E., in respect of an application made by the Kirkby-in-Ashfield Urban District Council for authority to raise £7000 for public works, it was stated that £1600 of it was for the erection of a duplicate pumping-station at the water-works. The Council proposed to purchase an additional engine of 65 H.P. for £985. The present plant, when working at its utmost capacity, pumped 20,000 gallons per hour; and it required 20 hours' pumping to supply the district. In case of a breakdown of one of the engines, there would be a serious shortage of water; and the Council felt the necessity of having duplicate plant.

Water Supply of Auckland (N.Z.).—It is reported that the construction of a large reservoir near the Waitakerci Falls, on the river of that name, will shortly have been completed, and that from it the water supply of Auckland will be drawn. This system of supply is only part of a larger scheme. An additional supply will be obtained from the River Nihotapu, and the necessary surveys are to be made without delay. It is estimated that from this river some 700½ million gallons can be drawn by means of two dams. Adding 220 million gallons from the Waitakerci dam, there would be a total supply available of over 920 million gallons, which should more than suffice for the needs of the city, assuming a dry season of three months in each year. The present average daily supply is about 4 million gallons. If it ever became necessary to further increase the water, another river could be effectively tapped for the purpose.

Widnes Water Supply.—At the Widnes Town Hall, last Friday, Mr. H. A. Reed held an inquiry on behalf of the Local Government Board into an application made by the Corporation for sanction to borrow a further sum of £4450 in respect of the Stocks Well pumping-station. The Town Clerk (Mr. H. S. Oppenheim) stated that in 1904 the Corporation obtained powers to borrow £14,000; but a sum of £16,544 had been spent, necessitating further borrowing powers for £2544. In addition, however, certain ground rents had been purchased for £1850, and with legal charges of £56 the total amount was brought up to £18,450. Mr. Isaac Carr, the Corporation Gas and Water Engineer, in the course of his evidence pointed out that Widnes was in a very fortunate position as regards its water supply. There were two pumping-stations—one at Netherley and one at Stocks Well; while they had an undeveloped water estate at Belle Vale. He did not think there was another town in the country where the consumption of water was so much per head of the population. This was largely due to the great quantity used in the town's chemical, copper, and soap works. If the whole of the resources of the Corporation were developed, they would be able to supply 8½ million gallons per day, or 80 gallons per head per day to a population of 100,000, assuming that the growth of the town's works was in proportion to the growth of the population. If the estimate were based upon the ordinary quantity of water used per head in large towns, the Widnes supply would meet the demands of a town of 300,000 inhabitants. Mr. Carr afterwards furnished explanatory details with reference to the undertaking.

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Southport and the Gas Supply of Birkdale.

At the monthly meeting of the Birkdale Urban District Council last Tuesday, Mr. F. J. Hartley obtained permission, on the presentation of the minutes of the Electricity, Lighting, and Licensing Committee, to offer a few observations on the subject of the gas supply of the town, which is now furnished by Southport, through mains which are the property of the Council. In the course of his remarks, he said the annual consumption of gas in Birkdale was about 100 million cubic feet; and the Council were advised that gas could be supplied of a much higher illuminating power and increased calorific value at 2s. per 1000 cubic feet, and still leave a good margin of profit to go to the reduction of the rates. Southport had been making a fine thing out of Birkdale with respect to the gas supply; and this was one of the chief reasons why the rates in the borough were lower than they would otherwise be. It was quite time Birkdale put her house in order in this respect. He moved—"That it be an instruction to the Clerk to notify the Southport Corporation forthwith that it is the intention of the Council to apply in the next session of Parliament for a Bill (*inter alia*) to terminate the privilege granted to the Southport Corporation under section 43 and other sections of the Southport Improvement Act, 1871, to supply gas to Birkdale, and for the use of the Birkdale gas-mains on terms; and that provision be made in the Bill for the acquisition of the gas-mains in the Ainsdale Ward of the urban district, and for the repeal of section 46 and other sections of the Act of 1871 relating to the supply of gas to Birkdale." At the request of the Chairman (Mr. H. Brodrick), Mr. Hartley put his motion in writing, and the minutes were adopted.

Exeter Water-Works Profit.—In presenting the annual report of the water undertaking to the Exeter City Council last Wednesday, Mr. C. E. Rowe described the water-works as a magnificent asset to the city. The income showed steady increase, the receipts from water-rents, meter-rents, &c., amounting to £16,300, compared with £16,164 in the previous year; and the balance of profit was £1889. The Water Committee recommended that £100 be added to the depreciation account and the balance appropriated to the relief of the general district rate. This was equivalent to 1¾d. in the pound. The city was to be congratulated on the undertaking, and on the able way in which it was managed by the Surveyor and his staff.

The Late Mr. Frank Wright.—In the "JOURNAL" last week, we recorded the death of Mr. Frank Wright, under circumstances which pointed to self-destruction. An inquiry into the matter was held at the Westminster Coroner's Court on the 6th inst., when the evidence given by Mrs. Wright in regard to the habits of the deceased and his mental condition, and by other witnesses as to the position in which he was found and the state of the room, left no doubt on the subject. A medical man who was called in deposed that when the unfortunate man was found he had been dead for several hours, and that his death was the result of poisoning by coal gas. The Jury returned a verdict of "Suicide during temporary insanity."

Lectures to Cardiff Girls on Cooking by Gas.—Nearly 150 girls, drawn from the twelve cookery centres under the supervision of the Cardiff Education Committee, listened with great interest last Friday afternoon to a lecture given by Miss Lillie Miles, at the offices of the Cardiff Gas Company, on "The Use of the Gas-Cooker." Miss Miles made the subject exceedingly interesting, and gave the girls some valuable hints on cooking, as well as on the management of a gas-stove. The Company are offering prizes for the best essays written by the girls on the subject of the lecture.

Suicides by Coal Gas.—An inquiry was recently held at Southend relative to the death of Mrs. Ida Greenbaum, who was found dead in her bedroom. She was lying on the bed, and had in her mouth a tube attached to a wall gas-bracket. Medical evidence was given to the effect that death was due to asphyxiation by coal gas; and a verdict of "Suicide while of unsound mind" was returned. A sensation was caused in the centre of Leeds on Monday last week by the discovery, on the premises of a firm of costumiers, of the dead body of a young man named Walter Dodd, employed as a window dresser. He was found in an upper room with the gas-stove turned on, and his mouth over the outlet—two sheets covering himself and the stove.

Northam Water Supply.—A Local Government Board inquiry has just been held at Northam, by Mr. A. G. Drury, respecting an application by the District Council for permission to borrow £1700 for the construction of two new filter-beds at the water-works. It was stated by the Clerk to the Council that when the Melbury works were constructed in 1902 the water was all that could be desired; but during the past year or two it had been discoloured, and the fact that water had been supplied to Bideford during a period of scarcity in that town had made further demands upon the filter-beds. Mr. W. Thornton, the Water Engineer, said the two filter-beds would have been sufficient if there had been no extra drain. The works were designed for a consumption of 120,000 gallons a day; but on some days last year they ran through as much as 200,000 gallons.

Teignmouth Water-Works Contract.—After correspondence and negotiations extending over more than a year, the Teignmouth District Council arrived last week at a settlement with Messrs. R. C. Brebner and Co., the Contractors who carried out the new water-works. In a letter which was read at a meeting of the Council last Tuesday, Messrs. Brebner agreed to accept the sum certified by the Engineer (£568) in full settlement of their claim. As the amount was due in February, 1909, it was suggested that interest should be added; but Messrs. Brebner did not put this forward as a claim. The Council decided to draw a cheque for the sum named; one of the members remarking that they had spent a considerable sum in legal expenses, and that this must be set against the Contractors' loss of interest. The Clerk, in answer to a question, stated that Messrs. Brebner's contract was for pipe-laying, and the amount was £7147; and their claim for extras brought the total up to £10,379. The Council had paid £6668; so that the amount which had been in question was £3711.

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New Joint-Stock Companies.—The Liss Gas Company, Limited, has been registered with a capital of £10,000, in £10 shares, to carry on the business of a gas and water company at Liss and elsewhere. The English Water-Works Construction and Canalization Company, Limited, has been registered with a capital of £52,500, in 50,000 preference shares of £1 each, and a like number of ordinary shares of 1s. each.

Cheaper Gas for Burton-on-Trent.—At the meeting of the Burton-on-Trent Town Council last Wednesday, Alderman Lowe, the Chairman of the Gas Committee, gave notice of a motion to reduce the price of gas 2d. per 1000 cubic feet to ordinary consumers and 4d. per 1000 cubic feet to slot-meter consumers. The present charges are 2s. 6d. to 2s. 4d. to the former class of consumers, and 3s. 4d. to the latter. At the same time meter-rents are to be abolished.

Higher Gas Profits at Loughborough.—At the meeting of the Loughborough Town Council on Monday last week, Alderman Bumpus, in moving the adoption of the reports of the gas and electricity undertakings, said the profit on the gas revenue account, had increased from £5766 in 1908-9 to £7034 in the year just closed. The increased profit was due to economical management and to getting more gas per ton of coal carbonized. The net result was that they were about £12 to the good.

Plucky Action by Mr. Samuel Glover.—In the early hours of Tuesday morning last, a fire broke out in the subway which has been made along Church Street, St. Helens, to convey the gas and water mains and the electricity and telephone cables. It was caused by the breaking of the live wire of the overhead equipment of the tramways, and it is thought the current earthed and started a fire among the combustible coverings of the cables in the subway. This was quickly extinguished, but gas was escaping at one point, and the subway was filled with dense smoke and gas. The Corporation Gas Engineer (Mr. Samuel Glover) was sent for; and, after reducing the pressure of gas at the works, he donned a smoke helmet belonging to the fire brigade and ultimately succeeded in locating the escape and stopping it.

Bahia Blanca Gas Company, Limited.—In the report to be presented by the Directors of this Company at the third ordinary general meeting on Thursday, the Directors state that the profits for the year ended the 31st of December last amounted to £5259, which, with £915 brought forward, makes an available total of £6174. Out of this they recommend a dividend of 3½ per cent. for the year on the "A" shares, free of income-tax, absorbing £5250, and carrying forward £924. Mr. J. M. Macmorran resigned his position as Secretary, and joined the Board as from the 1st of January last; Mr. W. Upton being appointed Secretary. The Directors state that business generally throughout Bahia Blanca and the surrounding districts has been much affected by the abnormal drought which has existed in these regions, and which undoubtedly has kept back the development of the undertaking. They are glad to add that the prospects for the current year are much more favourable, as the drought has ended.

Warrington Corporation Water Supply.—At the monthly meeting of the Warrington Town Council last Tuesday, the accounts of the water undertaking for the year ended the 31st of March last were presented. They showed that the gross income during the year was £27,530, and the expenditure £7849; leaving a gross profit of £19,681. The interest on loans, bank interest, and contributions to the sinking fund came to £18,216; leaving a profit of £1465, against a net profit of £1095 the previous year. The total expenditure decreased by £430, notwithstanding an increased payment of £184 for rates and taxes. The net profit has been kept in hand to increase the working balance, which now amounts to £5064. The reserve fund has £3988 in hand; and the sinking fund has £453 standing to its credit. The capital account has been overdrawn to the extent of £20,953. The loans, &c., taken up amount to £426,273, and the sum of £47,159 has been paid off; leaving an outstanding debt of £379,114.

APPLICATIONS FOR LETTERS PATENT.

13,052.—Earle, C., "Automatically lighting and extinguishing lamps." May 30.

13,054.—Grice's Gas-Engine Company, Ltd., and Purser, W. H., "Suction-gas producers." May 30.

13,098.—Sheppee, F. H., and Shippey, M. W., "Pumps for viscous liquids." May 30.

13,137.—Samoje, L., "Gas-turbines." May 31.

13,170.—Bostock, F. H., "Coin-freed gas-meters." May 31.

13,184.—Smith, E. W., "Coin-freed gas-meters." May 31.

13,193.—St. John, L. M., and Wardrop, M. B., "Burners." May 31.

13,215.—Falk, Stadelmann, and Co., Ltd., and Falk, S., "Inverted incandescent burners." May 31.

13,234.—Smith, J. S., "Gas-retorts." June 1.

13,237.—Merrall, C. E., "Valves and cocks." June 1.

13,249.—Bryden, H. N., "Coal-conveyors." June 1.

13,253.—Lea, J. W., and Perrins, J. H., "Globe-holders." June 1.

13,284.—Cuss, C. T., "Improved system for incandescent gas lighting, heating, and power." June 1.

13,322.—Aldridge, J. G. W., and M'Minn, A. C., Jun., "Discharging and charging retorts." June 1.

13,327.—Koppers, H., "Separating ammonia from gases." June 1.

13,365.—Fletcher, Russell, and Co., Ltd., and Fletcher, T. W., "Gas and water taps." June 2.

13,381.—Berry, J., and Meters Limited, "Gas-meters." June 2.

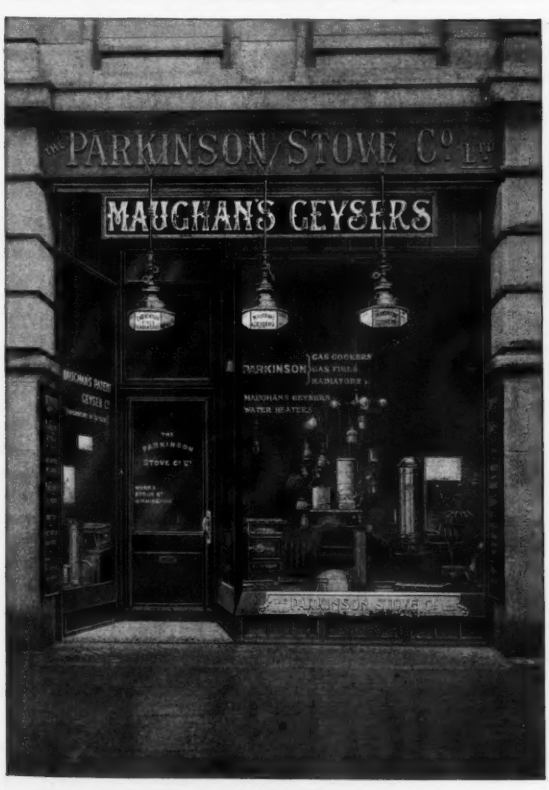
13,411.—Duckham, A. M'D., "Gas-tight doors." June 2.

13,421.—Dieu, E., "Cleaning gas used in engines." June 2.

13,435.—Birngruber, G., "Burner and mantle." June 3.

13,585-6.—Haarmann, W., "Four-stroke cycle gas-engines." June 4.

13,591.—Hardingham, G. G. M., "Purifying gases." A communication from Metallurgische Ges.-Akt. June 4.



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The Directors of the Haslingden Union Gas Company announce a reduction in the price of gas to consumers from 3s. 4d. to 3s. 2d. per 1000 cubic feet.

Arrangements are in hand for the formal official opening next month of the Bacup Corporation new water-works at Cowpe, near Waterfoot. The scheme has involved an outlay of over £230,000.

The Mid Sussex Water Board are gradually obtaining the ownership of the water supply of their district. The public contribution last year was £2622, while for the previous year it was £1638. Water-rentals have increased, and the expenditure has decreased; and the profits are equivalent to 5 per cent. on the capital invested.

The Directors of the European Gas Company, Limited, have decided to recommend the payment of the same dividend and bonus as last year—viz., 10s. per share on the fully-paid shares, and 7s. 6d. per share on those on which £7 10s. has been paid, together with a bonus of 2 per cent. on all shares, according to the amount paid thereon.

At a smoking concert held last Wednesday evening, Mr. E. H. Frost, one of the employees of the Ipswich Gas Company, who is leaving to take an appointment at Bognor, was presented with a gold-mounted silk umbrella, suitably inscribed with his monogram, accompanied by the best wishes of the donors for his success in his new position.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

REPRESENTATIVE (LONDON). No. 5272.
GAS MANAGER, Omagh Urban District Council. Applications by June 28.
MANAGING REPRESENTATIVE (AUSTRALIA). John Wright and Co., Birmingham.
MAIN AND SERVICE LAYER. No. 5254.

Situation Wanted.

DISTRIBUTING DEPARTMENT. No. 5248.

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GAS METERS. No. 5251.
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Patent Licences.

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WASHING AND COOLING GAS. Cruikshank and Fairweather, Chancery Lane, W.C.

Stocks and Shares.

CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY. June 28.

TENDERS FOR

Benzol.

ILFRACOMBE GAS COMPANY. Tenders by June 28.

Coal and Cannel.

BAKEWELL URBAN DISTRICT COUNCIL. Tenders by June 30.
BROADSTAIRS GAS COMPANY. Tenders by July 5.
CARNARVON GAS DEPARTMENT. Tenders by June 24.
EAST RETFORD GAS DEPARTMENT. Tenders by June 30.
EVESHAM GAS DEPARTMENT. Tenders by June 27.
EXMOUTH GAS COMPANY. Tenders by July 4.
FILEY URBAN DISTRICT COUNCIL. Tenders by June 27.
HINCKLEY GAS DEPARTMENT. Tenders by June 25.
HUYTON AND ROBY GAS COMPANY. Tenders by June 18
ILFRACOMBE GAS COMPANY. Tenders by June 28.
KESWICK GAS COMPANY. Tenders by June 23.
LURGAN GAS COMPANY. Tenders by July 4.
MALTON GAS COMPANY. Tenders by June 20.
MANSFIELD GAS DEPARTMENT. Tenders by June 29.
NEWRY GAS DEPARTMENT. Tenders by June 24.
NORTHWICH GAS COMPANY. Tenders by June 23.
PONTYPRIDD URBAN DISTRICT COUNCIL. Tenders by June 20.
TEIGNMOUTH GAS DEPARTMENT. Tenders by July 4.

Gasholder Tank (Concrete).

OLDHAM GAS DEPARTMENT. Tenders by June 29.

Lime.

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Purifiers, &c.

MALVERN URBAN DISTRICT COUNCIL. Tenders by June 23.

Purifier Grids.

ROCHDALE GAS DEPARTMENT. Tenders by June 22.

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BAKEWELL URBAN DISTRICT COUNCIL. Tenders by June 30.
BRIDGEWATER COLLIERIES COKE-WORKS. Tenders by June 20.
FARNWORTH AND KEARSLEY GAS COMPANY. Tenders by June 29.
KESWICK GAS COMPANY. Tenders by June 23.
MANSFIELD GAS DEPARTMENT. Tenders by June 29.
OLDHAM GAS DEPARTMENT. Tenders by June 21.
READING GAS COMPANY. Tenders by June 20.

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CAST-IRON Pipes. Spigot and Socket or Flanged. Special Quality—9 feet or 12 feet Lengths. When buying, Write us. A. Lowcock, Limited, Shrewsbury.

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IT is Worth Your While to Buy Direct. The RELIANCE LUBRICATING OIL COMPANY supply the best value in NON-CORROSIVE LUBRICANTS—viz, Motor Waggon Oil, 1s.; Motor Car Oil, 2s.; Engine, Cylinder, and Machinery Oils, 1s.; Axle Oil, 10½d.; Exhauster Oil, 10d.; Special Cylinder Oil, 1s. 4d.; 650 T Cylinder, 2s.; Special Engine Oil, 1s. 4d.; Gas Engine and Oil Engine Oil, 1s. 6d.; Refrigerator, 1s. 9d.; Renown Engine Oil, 11½d.; and Astral Disinfectant, 2s. 6d. per gallon. Barrels free, carriage paid. Solidified Oil, 25s. cwt. The Reliance Lubricating Oil Company, 19 & 20, Water Lane, Tower Street, London, E.C.

APPOINTMENTS.—Ambitious Men of Parts invited to write— HERBERT GREATOREX, APPLICATION SPECIALIST, BEECHWOOD, MATLOCK. Specimen of many results:— "Have got the job. Quite a good start. To you the credit is due, and I think your fee the best Investment I ever made." BUSINESS IS REVIVING. WRITE NOW.

TO GAS ENGINEERS AND MANAGERS. (Distributing Department.)

APPOINTMENT required by Adver- tiser, who is well up in Mains and Service Laying, Most up-to-date Methods of Indoor and Outdoor Lighting, Cookers, Gas-Fires, and Fittings. Last Appointment as Distribution Superintendent. Age 26. Energetic, Teetotaler, Satisfactory Reasons for Making Change. Excellent Testimonials. Address No. 5248, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

R. & G. HISLOP, GAS ENGINEERS, RETORT BUILDERS, CONTRACTORS, &c. RETORT SETTINGS, COAL-TESTING PLANT, BOILER FIRING. Communications should be addressed to Underwood House, PAISLEY.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere. Firth Blakeley, Sons, and Company, Limited, Thornhill, Dewsbury.

CITY and Guilds Examinations in Gas Engineering and Gas Supply. Students who have done badly at the recent Examinations should join Mr. Cranfield's Correspondence Classes for next Session. Assistance ample, individual, and private. Write at once, 11, Avondale Place, Halifax.

ADVERTISEMENT No. 5247.

OWING to the Great Number of Ap- plications, it will be some little time before the Appointment is definitely settled.

WANTED, a thoroughly Reliable and Energetic REPRESENTATIVE for London. Must have a Connection and good knowledge of the Gas-Fitting and Incandescent Trade. Good Remunerato to a Suitable Man. Apply at once, by letter, with full Particulars of Past Experience and References, to No. 5252, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

THE Omagh Urban District Council require the Services of a Competent GAS MANAGER, who will be required to keep a plain set of Books. Salary, £120 per Annum, with free House, Coal, and Gas. Applications, with *copies* of Testimonials, must be lodged on or before Tuesday, the 28th inst. Wm. J. Corker, Clerk to the Council. Urban Council Chambers, Omagh, June 9, 1910.

MANAGING Representative for Australasian Colonies wanted by large Gas-Stove Manufacturers. Permanent and Progressive Post to Experienced and Capable Man. Address, stating Age and full Particulars of Experience and Qualifications, John Wright and Co., Essex Works, Birmingham.

MAIN AND SERVICE LAYERS.

WANTED, at once, an Experienced MAIN and SERVICE LAYER. Must be a thoroughly Practical Man. Apply, by letter, stating Age, Experience, and sending *copies* of Three recent Testimonials, to No. 5254, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

SMALL EXHAUSTER WANTED.

WANTED, a Second-Hand Gas- EXHAUSTER and STEAM-ENGINE capable of passing up to 5000 Cubic Feet per Hour. Full Particulars, including Price, Condition, and Design, to be sent to No. 5253, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

FOR SALE—Forty-nine 21-inch by 15- inch ⊓ to Round MOUTHPIECES, Self-Sealing, Fourteen New; being removed on introduction of Machinery. Offers to the Secretary, Gas Offices, Sutton, Surrey.

GASHOLDERS—Splendid 45 feet dia- meter and New STEEL TANK, fixed Complete to Plan and Specification; also 14 feet and 16 feet Diameter GASHOLDERS, with STEEL TANKS. Can be seen temporarily erected. Re-erected Cheap for immediate Sale. Firth Blakeleys, Thornhill, Dewsbury.

FOR SALE—Good Second-Hand Dry Tin-Cased GAS-METERS, made by the Gas Meter Company, Limited. One 300-Light; Two 200-Light; Four 100-Light; One 50-Light. Just been displaced by Electricity. Apply, by letter, to No. 5251, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

COUNTY BOROUGH OF OLDHAM.

THE Oldham Corporation Gas-Works Committee invite TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR produced at their different Works during the Year commencing July 1, 1910.

Copy of Specification and Form of Tender may be obtained on Application to Mr. Arthur Andrew, Gas and Water Offices, Oldham, to whom Tenders are to be sent not later than Tuesday, June 21, 1910.

J. H. Hallsworth, Town Clerk.

Oldham, June 9, 1910.

COUNTY BOROUGH OF OLDHAM.

THE Oldham Corporation Gas Works Committee invite TENDERS for the Construction of a CONCRETE GASHOLDER TANK, 212 feet in diameter by 41 feet deep, adjoining their Hollinwood Gas Station.

Copies of Specification and Drawings can be obtained on Application at the Gas Offices, Greaves Street, Oldham, on payment of Two Guineas, which sum will be returned on receipt of a *bonâ fide* Tender.

Tenders will be received up to and including June 29, 1910.

J. H. Hallsworth, Town Clerk.

Oldham, June 9, 1910.

BOROUGH OF EVESHAM. (Gas Department.)

TENDERS FOR GAS COAL.

THE Evesham Corporation invite TENDERS for the Supply of from 1000 to 3000 Tons (or less if required) of Best Screened GAS COAL, during the Year ending June 30, 1911, to be delivered on Rail at Evesham.

Tenders, to be marked "Tender for Gas Coal," to be sent to me not later than the 27th day of June inst. and to include full description as to Coal and Price.

No Form of Tender supplied.

The Corporation do not bind themselves to accept the lowest or any Tender.

Thos. A. Cox, Town Clerk.

Town Clerk's Offices, Evesham, June 4, 1910.

MALTON GAS COMPANY.

TENDERS FOR COAL.

THE Directors invite Tenders for the Supply of 4500 to 5500 Tons of GAS COAL in the Twelve Months ending June 30, 1911.

Delivery to be made at the North-Eastern Railway Company's Depôt, Malton.

The Coal must be of Good Quality, suitable for Gas-making, and free from Bats, Pyrites, and other Refuse.

The Tender may be for Screened, Unscreened Coal, or Nuts.

Payments will be made Monthly.

The following are the approximate Monthly Quantities required:—

1910.		1911.	
July	200 Tons.	Jan.	650 Tons.
Aug.	350 ,,	Feb.	500 ,,
Sept.	450 ,,	March	450 ,,
Oct.	450 ,,	April	350 ,,
Nov.	500 ,,	May	350 ,,
Dec.	650 ,,	June	250 ,,
	2600 ,,		2550 ,,

Tenders to be addressed to the undersigned and sent in on or before Monday, the 20th of June inst.

Henry Tobey, Engineer.

Malton, Yorks.

HINCKLEY URBAN DISTRICT COUNCIL.

(Gas Department.)

THE above Council invite Tenders for GAS COAL or NUTS, to be delivered at Hinckley Station.

Tender Forms may be obtained from Mr. Fred Lee, Gas Manager.

Endorsed Tenders to be delivered to me on or before Saturday, the 25th day of June, 1910.

A. S. Atkins,
Clerk to the Council.

Council Offices, Hinckley,
June 9, 1910.

MALVERN URBAN DISTRICT COUNCIL.

(Gas and Electricity Department.)

THE above Council invite Tenders for Additional PURIFIERS and ALTERATIONS to Existing Purifiers at their Gas-Works, Malvern Link.

Specification and Form of Tender can be obtained from the undersigned on payment of 10s. 6d., which will be returned on receipt of a *bonâ-fide* Tender.

Tenders, endorsed "Tender for Purifiers," to be returned to the Clerk, Henry Lawson Whatley, Esq., Council Offices, Malvern, not later than Ten a.m. on Thursday, the 23rd day of June, 1910.

The Council do not bind themselves to accept the lowest or any Tender.

W. J. Rendell Baker,
Engineer and Manager.

BOROUGH OF EAST RETFORD.

TENDERS FOR GAS COAL.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the Supply and Delivery at the Sidings of the Great Northern or Great Central Railway Companies, Retford, of 8000 Tons of Best Screened GAS COAL or NUTS during the Year ending June 30, 1911.

The Coal must be Freshly Worked and free from Bats, Bind, or other objectionable matter.

Sealed Tenders, Specifying the quality of the Coal and the name of the Pit from which it is raised, to be sent in on or before June 30, 1910, addressed to the Chairman of the Gas Committee, endorsed "Tender for Gas Coal."

Forms of Tender and any further Particulars may be obtained from the undersigned.

J. B. Fenwick,
Engineer and Manager.

Gas and Water Office,
Retford, June 9, 1910.

TENDERS FOR GAS COAL.

THE Gas Committee of the Carnarvon Corporation invite TENDERS for the Supply of 3000 Tons of Best Screened GAS COAL NUTS and 200 Tons of Screened CANNEL, to be delivered free as required in Trucks on the Gas-Works Siding, Carnarvon, during the Twelve Months ending the 31st of August, 1911.

Sealed Tenders, endorsed "Tender for Coal," and addressed to the Chairman of the Gas Committee, Guildhall, Carnarvon, to be delivered on or before Friday, the 24th inst.

The Committee reserve to themselves the right to divide the quantity into two or more Contracts, and do not bind themselves to accept the lowest or any Tender.

Forms of Tender and Specification to be had on Application to the undersigned.

William M. Ruxton,
Manager.

Gas Offices, Carnarvon.
June 9, 1910.

TENDERS FOR COAL, CANNEL, AND SLACK.

THE Huyton and Roby Gas Company are prepared to receive TENDERS for the following—viz.:

2600 Tons of GAS COAL, in the form of Nuts or Slack.
250 Tons of Best Round CANNEL.
250 Tons of STEAM SLACK.

To be delivered during the Year ending June 30, 1911, at the Gas-Works Siding, Huyton Quarry, in such Quantities and at such times as may be required by the Company.

The Company will provide their own Waggons for the transit of a portion of the Coal.

Tenders, Specifying the Description of the Coals, &c., the name of the Pit from which they are raised, and endorsed "Coals," may be sent in to the undersigned not later than the 18th inst.

The Directors do not bind themselves to accept the lowest or any Tender.

Fred. Pritchard,
Secretary and Manager.

June 9, 1910.

EXMOUTH GAS COMPANY.

THE Directors of the Exmouth Gas Company invite TENDERS for the Supply of about 6000 Tons of Best GAS COAL (Screened or Unscreened), to be Delivered in such Quantities and at such times as may be required from the 1st of August, 1910, to the 31st of August, 1911, and to weigh 20 cwt. to the Ton over the Gas Company's or Dock Company's Weighbridge, the Coal to be Fresh Wrought, Dry, and free from Hards, Smudge, Shale, and Pyrites.

Tenders to be accompanied by Practical Working Analysis.

Prices may be quoted c.i.f. or f.o.b. (by Sailing Vessels only) Exmouth Docks, or f.o.r. Exmouth Railway Station (London & South Western Railway).

Sealed Tenders, endorsed "Tender for Coal," to be sent to the undersigned not later than Monday, the 4th of July, 1910,

The Directors do not bind themselves to accept the lowest or any Tender.

Special Tender Forms are not provided or required.

James T. Foster,
Secretary and Manager.

Gas-Works, Exmouth,
June 6, 1910.

ILFRACOMBE GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for the Supply of GAS COAL and BENZOL from the 1st of July next.

Particulars and Conditions may be obtained from the undersigned, on receipt of a Stamped Addressed Envelope.

Sealed Tenders, endorsed "Contracts," addressed to the Chairman, and delivered to the undersigned, not later than Tuesday, June 28, 1910.

The Directors reserve to themselves the right to accept the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

J. Armstrong,
Manager.

Gas-Works, Ilfracombe,
June 6, 1910.

LURGAN GAS, LIGHT, AND CHEMICAL COMPANY, LIMITED.

THE Directors invite Tenders for the Supply of about 3500 Tons of Best Quality Screened GAS COAL, delivered into the Works at Lurgan, or placed on Lighters or on Rail at Belfast.

The Coal must be delivered in such Quantities and at such times as the Directors may fix; and the weights as shown on the Company's Weighbridge to be accepted by the Contractor. Each Cargo to be accompanied by a Certificate as to place of origin.

Tenders (no Special Form in use), accompanied by Reference to Gas-Works using the Coal offered, should reach me not later than Monday, July 4, 1910, at Ten o'clock a.m.

The Directors do not bind themselves to accept the lowest or any Tender.

Fred. W. Magahan,
Secretary.

Gas-Works, Lurgan,
June 6, 1910.

PONTYPRIDD URBAN DISTRICT COUNCIL.

THE above Council invite Tenders for the Supply of GAS COAL and CANNEL as required for their Gas-Works, and also for WASHED NUTS, as required for their Electricity Works for the Twelve Months ending June 30, 1911.

All the above are to be delivered at the Gas-Works Siding, on the Alexandra (Newport and South Wales) Docks and Railway Company's Line, Glyntaff.

Forms of Tender and Specification may be obtained, for Gas Coal and Cannel, on Application to Mr. E. H. Swain, Engineer, Gas-Works, Treforest, Pontypridd; and for Washed Nuts to Mr. J. E. Teasdel, A.M.I.E.E., Engineer, Electricity Works, Treforest, Pontypridd.

Tenders, endorsed "Gas Coal," "Cannel," or "Electricity Coal" (as the case may be), must be received by the undersigned on or before Monday, June 20, 1910.

The Council do not bind themselves to accept the lowest or any Tender.

J. Colenso Jones,
Clerk to the Council.

Municipal Buildings, Pontypridd,
June 7, 1910.

FILEY URBAN DISTRICT COUNCIL.

TENDERS FOR COAL.

THE Council invite Tenders for the Supply of 1800 to 2000 Tons of GAS COAL, in the Twelve Months ending the 30th of June, 1911.

Delivery to be made at the North-Eastern Railway Company's Depôt, Filey.

The Coal must be of good quality, suitable for Gas Making, and free from Bats, Pyrites, and other Refuse.

The Tender may be for Screened, Unscreened Coal, or Nuts.

Payments will be made Monthly.

The following are the approximate Monthly Quantities required:—

1910.		1911.	
July . .	160 Tons	Jan. . .	170 Tons.
Aug. . .	250 ,,	Feb. . .	140 ,,
Sept. . .	200 ,,	March .	140 ,,
Oct. . .	160 ,,	April . .	110 ,,
Nov. . .	160 ,,	May . .	110 ,,
Dec. . .	190 ,,	June . .	100 ,,
	1120		770

Tenders to be addressed to the Chairman, Urban Council, Filey, and to be sent in on or before the 27th of June, 1910.

Henry Tobey,
Engineer.

Malton.

MANSFIELD CORPORATION.

(Gas Department.)

TENDERS FOR GAS COAL, CANNEL, AND LIME,

AND

TENDERS FOR SURPLUS TAR.

Coal.

THE Gas Committee are prepared to receive TENDERS for 1000 Tons of CANNEL and 12,000 Tons of Best Screened GAS COAL, Delivered at Mansfield Station for One Year from the 1st of July, 1910, to the 30th of June, 1911.

Lime.

For the Supply of about 150 Tons of Best Hand Picked LIME. Delivered as above.

Tar.

TENDERS for Surplus TAR made from the 1st of July, 1910, to the 30th of June, 1911.

Tenders, endorsed "Coals," "Lime," or "Tar," as the case may be, to be sent to J. Harrop White, Esq., Town Clerk, Mansfield, on or before June 29, 1910.

Particulars and all other Information from the undersigned.

Note: *No Special Forms of Tender provided.*

The Committee do not bind themselves to accept the lowest or any Tender.

Arthur Graham,
Engineer and Manager.

Gas-Works, Mansfield,
June 8, 1910.

BRIDGEWATER COLLIERIES COKE-WORKS.

(The Earl of Ellesmere.)

TENDERS are invited for the Tar pro- duced at the above Works for a period of Six or Twelve Months from the 1st of July, 1910, delivered into Contractor's Tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley Branch of the Lancashire and Yorkshire Railway; or at the Brackley Siding, Little Hulton Mineral Branch of the London and North-Western Railway.

The estimated quantity is about 2600 Tons per Annum.

Tenders, endorsed "Tender for Tar," to be addressed to Mr. Thomas M. Brown, Bridgewater Coal Offices, 4, Chapel Walks, Manchester, not later than the 20th of June.

Manchester, May 31, 1910.

BROADSTAIRS GAS COMPANY.

THE Directors of the above Company invite TENDERS for the Supply of about 6500 Tons of Best Durham or Yorkshire GAS COALS, to be delivered between the 1st of August, 1910, and July 31, 1911.

Sealed Tenders, endorsed "Gas Coal," addressed to the Chairman of the Company, Gas Offices, Broadstairs, to be sent in not later than the 5th of July, 1910.

The Directors do not bind themselves to accept the lowest or any Tender.

Further Particulars and Form of Tender may be obtained from

F. Higginson,
Engineer, Manager, and Secretary.

Gas Offices, Broadstairs,
June 3, 1910.

URBAN DISTRICT COUNCIL OF NEWRY.

TENDER FOR GAS COAL.

THE Gas Committee of the above Council invite TENDERS for the Supply and Delivery of about 5000 Tons of GAS COAL, Screened and Unscreened, for Twelve Months commencing July 1 next.

Specification and Form of Tender may be obtained on Application to Mr. B. Gibson, Gas Manager.

Sealed Tenders, endorsed "Coal," to be forwarded to the Chairman, Gas Committee, Town Hall, Newry, not later than Friday, the 24th inst.

The lowest or any Tender not necessarily accepted.

Wm. M. Cronin,
Town Clerk.

Town Hall, Newry,
June 10, 1910.

BOROUGH OF ROCHDALE.

(Gas Department.)

THE Gas and Electricity Committee of the above Corporation invite TENDERS for the Supply of about 11,800 Superficial Feet of 2-inch WHITE DEAL PURIFIER GRIDS, with Oak sides, made to dimensions supplied.

Particulars may be obtained on Application to Mr. T. Banbury Ball, the Manager, at the Gas-Works, Dane Street.

Tenders, endorsed "Purifier Grids," and addressed to the Chairman of the Gas and Electricity Committee, must be sent in to me not later than noon on Wednesday, June 22, 1910.

By order,
Wm. Henry Hickson,
Town Clerk.

Town Hall, Rochdale,
June 10, 1910.

TEIGNMOUTH URBAN DISTRICT COUNCIL.

THE Gas Department of the above Council invite TENDERS for the Supply of 4000 Tons of Best Durham or other good GAS COAL, Screened or Unscreened. The same to be supplied to the requirements of the Council between the 31st day of July, 1910, and the 30th day of June, 1911.

The Coal must be fresh Wrought and free from all impurities.

No Special Tender Form will be issued.

Tenders must be accompanied by a full Description, and Practical Working Analysis of the Coals quoted and may be either f.o.b. at port of shipment, Teignmouth Harbour, f.o.r. Teignmouth Railway Station, or delivered into the Gas-Works Store.

Sealed Tenders endorsed "Gas Coals," to be addressed to A. Percival Dell, Esq., Clerk to the Council, Town Hall, Teignmouth, and delivered not later than Monday, the 4th day of July, 1910.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
J. Alex. Gray,
Gas Manager

Gas-Works, Teignmouth,
June 11, 1910.

READING GAS COMPANY.

TENDERS FOR TAR.

THE Directors of the Reading Gas Com- pany invite TENDERS for the Purchase of their Surplus Coal-Gas TAR and Carburetted Water-Gas TAR, for One Year, commencing on the 1st of July next.

Specifications for the Contract will be forwarded on Application to the Engineer and Manager, Mr. Douglas H. Helps, Assoc.M.Inst.C.E.

Under the Conditions of the Contract, an allowance will be made for all water that may be found in the Tar in excess of 5 per cent.

Railway and River Communication direct to the Works.

Tenders, endorsed "Tender for Tar," and addressed to the undersigned, must be delivered not later than Monday, the 20th inst.

The Directors do not bind themselves to accept the highest or any Tender.

A. Canning Williams,
Secretary.

159, Friar Street, Reading,
May 31, 1910.

NORTHWICH GAS COMPANY.

THE Directors of the Northwich Gas Company invite TENDERS for the Supply of about 7000 Tons of GAS COAL during the Year ending June 30, 1911.

Full Particulars and printed Form of Tender may be had on Application to the undersigned.

Tenders, endorsed "Coal," are to be sent in addressed to the Chairman, by Thursday, June 23, 1910.

SAML. S. MELLOR,
Manager and Secretary.

Gas-Works, Northwich.

THE Directors of the Keswick Gas Company invite TENDERS for the Supply of 2000 Tons of Best Screened GAS COALS or NUTS, to be delivered at Keswick Railway Station between the 1st day of July, 1910, and the 1st day of July, 1911, in such Quantities and at such times as may be required.

Tenders, stating Price per Ton, endorsed "Tender for Coal," to be sent to the undersigned not later than the 23rd inst.

The Directors do not bind themselves to accept the lowest or any Tender.

No Form of Tender supplied.

J. H. BRODIE,
Secretary.

Main Street, Keswick,
June 10, 1910.

THE Directors of the Keswick Gas Company invite TENDERS for their Surplus TAR and AMMONIACAL LIQUOR for Twelve Months from the 30th inst., at per Ton delivered into Contractors' Tanks at Keswick Railway Station.

Tenders, endorsed "Tender for Tar," or "Tender for Liquor," will be received by the undersigned up to Four p.m. of Thursday, the 23rd inst.; but the Directors do not bind themselves to accept the highest or any Tender.

Forms of Tender are not supplied.

J. H. BRODIE,
Secretary.

Main Street, Keswick,
June 10, 1910.

FARNWORTH AND KEARSLEY GAS COMPANY.

THE Directors are prepared to receive TENDERS for their Surplus Make of TAR and AMMONIACAL LIQUOR for a Term of One Year commencing the 1st of July, 1910.

Sealed Tenders to be addressed to James Fletcher, Esq., J.P., Chairman, Gas Offices, Cross Street, Farnworth, near Bolton, and delivered not later than Wednesday, the 29th of June next.

Forms of Tender and any further Information required may be obtained from Mr. H. Pickford, Manager.

W. BROMLEY,
Secretary.

Gas Offices, Farnworth,
June 10, 1910.

BAKEWELL URBAN DISTRICT COUNCIL.

TENDERS are invited for the Supply of COAL—1300 to 1500 Tons—and 200 Tons of CANNEL for One Year, delivered at Bakewell Station (Midland).

Forms of Tender and Particulars can be obtained from the undersigned, to whom Tenders must be sent by the 30th of June.

Also for the Purchase of Surplus TAR and LIQUOR during Twelve Months from July 1, next. Delivery free in Purchasers' Tanks at Bakewell Station (Midland).

Endorsed Tenders to reach undersigned by June 30.

V. R. COCKERTON,
Clerk.

Bakewell.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY.

NEW ISSUE OF
£2000 CONSOLIDATED ORDINARY STOCK AND £1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, June 28, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, relating to DEBENTURE STOCK ONLY, WILL BE CLOSED on the 23rd of June, 1910, and RE-OPENED on the 1st of July, 1910.

By order of the Board,
ERNEST W. DREW,
Secretary.

6 & 7, Queen Street,
London, E.C., June 8, 1910.

CITY OF CHICHESTER GAS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of the FOUR PER CENT. PERPETUAL DEBENTURE STOCK of this Company WILL BE CLOSED from the 17th of June to the 30th of June, 1910, both inclusive.

By order.
VICTOR V. VICK,
Secretary.

Offices: Stockbridge Road,
Chichester, June 6, 1910.

THE Proprietor of Letters Patent No. 12,751 of 1907, relating to "Apparatus for Washing and Cooling Gas," desires to DISPOSE of the Patent, or to Grant LICENCES to interested Parties on Reasonable Terms, with a view to the adequate Working of the Patent in this Country.

Enquiries to be addressed to CRUIKSHANK AND FAIRWEATHER, LIMITED, International Patent Agency, 65-66, Chancery Lane, LONDON, W.C.

THE Proprietor of the Patent No. 19,146 of 1906, for "IMPROVEMENTS IN REGENERATING COKE-OVENS," is desirous of entering into Arrangements by way of LICENSE and otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring its Full Development and Practical Working in this Country.

All Communications should be addressed in the first instance to HASELTINE, LAKE, AND CO., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, LONDON, W.C.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

HEATHCOTE GAS COAL
from the
GRASSMOOR COLLIERIES,
CHESTERFIELD.
Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

ALL the
BOYS CALORIMETERS
which have been in daily use in all the Official Testing Stations in London for the last Four Years
WERE MADE BY
JOHN J. GRIFFIN & SONS, LTD.
Those desiring to obtain Gas Calorimeters as used in the Official Testing Places should see that the apparatus bears the name of the original makers

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KINGSWAY, LONDON, W.C.

Each Apparatus should be marked thus:

PRICE GREATLY REDUCED.
Terms on Application.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE, LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
Shipments Promptly and Carefully Executed.

London Office: E. C. Brown & Co., Leadenhall Chambers, 4, St. Mary Axe, E.C.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.

THOMAS TURTON
AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
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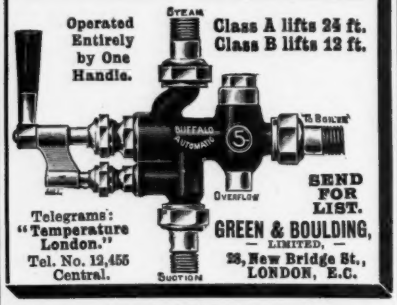

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GRAETZIN LIGHT

Important Improvements.

BURNERS.

1. **20-Candle Power more light** without increase in the consumption of gas.
2. **Patent Gas Adjuster;** cannot get out of order.
3. **Automatic Gas Regulator,** ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. **Accurate Regulation of the Air Supply.**
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

LAMPS.

From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

THE GLENBOIG UNION FIRE-CLAY CO., LTD.

GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

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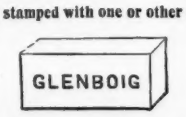

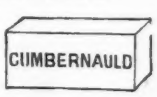

The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.
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Undernoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, LEADENHALL STREET,
LONDON, E.C., September 21st, 1909.

DEAR SIRS,

I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	3·03	3·49
Silica, combined	43·20	49·77
Alumina	36·55	42·10
Ferric oxide	1·80	2·08
Titanic oxide	1·30	1·50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0·92	1·06
Loss on Ignition	13·20	—
	100·00	100·00

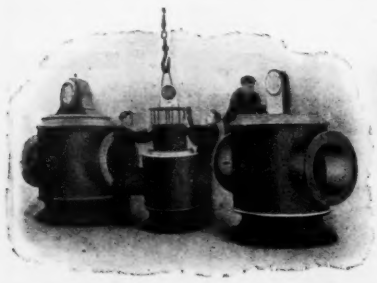
PHYSICAL RESULTS.

Density	2·65
Volume weight	1·90
Porosity	15·4 %
Linear shrinkage at 100° C.	3·70%
" " " 1050° C.	4·76%
" " Total	8·46%
Volume shrinkage at 100° C.	10·7 %
" " " 1050° C.	12·6 %
" " Total	23·3 %
Plasticity	20·0 %
Fire Stability	1850° C. equiv. 3362° F. (SEGER CONE 36.) (New Scale CONE 38.)

(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes.—I am, yours faithfully,

JOHN T. NORMAN.



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SOLE MAKERS AND LICENSEES OF THE
"Simplex" AUTOMATIC GAS LIGHTER AND EXTINGUISHER.

Some of its Special Advantages are:

1. It is instantaneous in Lighting and Extinguishing without shock to Mantle, and can be set to its pre-determined times in a few seconds.
2. The Mechanism will act correctly, even though the Lamp-post and Controller be out of the perpendicular.
3. **THE VALVE.**—As this never leaves its seat, and the gas-ways being away from the seating, no impurities can collect between the valve and the seating, and by simply removing a small cap, the gasways can be freed of Naphthalene or any other matter.
4. The leakage of gas into the Clock Mechanism and its resultant troubles are entirely done away with.
5. Vibration of any description will not cause the Mechanism to operate prematurely.
6. The "Simplex" Clock also has the advantage of a Lever Escapement.

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Telegraphic Address: 'Gasometer Nottingham." Telephone: 204X Nottingham.

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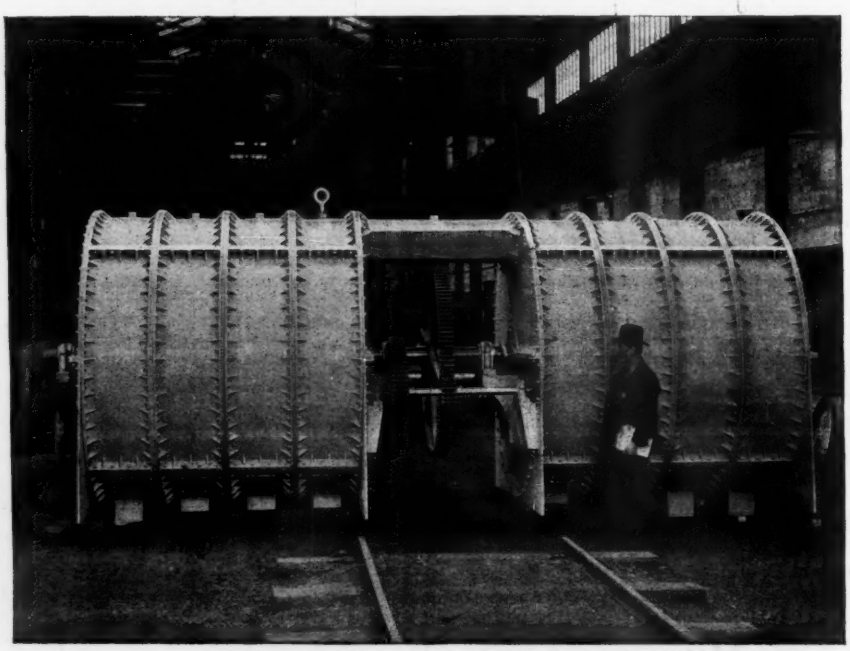
THE WHESSOE FOUNDRY CO., LTD.
Works: DARLINGTON.



"Whessoe" Rotary Washer-Scrubber, with Central Driving arrangement, Patent No. 27,158, 1904, as supplied to The Stourbridge Gas Company.

London Office: 106, CANNON STREET, E.C.

Welsbach LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

Height over all.

1-light . . .	1 ft. 8 ins.
2-light . . .	2 ft. 4 ins.
3-light . . .	2 ft. 4 ins.
4-light . . .	2 ft. 7 ins.

Width over all.

1-light . . .	1 ft. 1 in.
2-light . . .	1 ft. 5 ins.
3-light . . .	1 ft. 5 ins.
4-light . . .	1 ft. 8 ins.

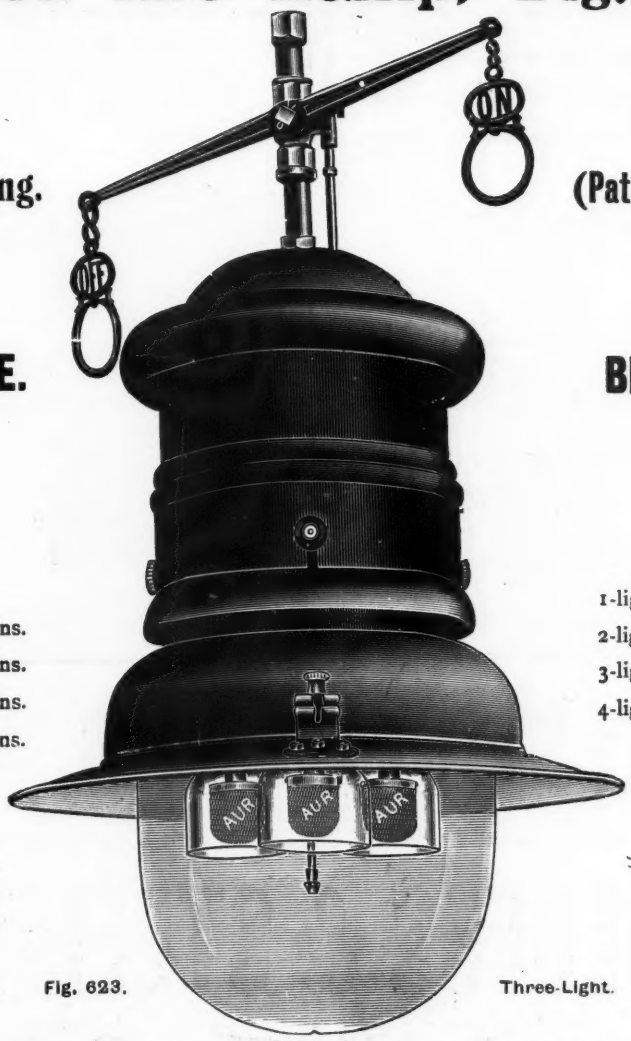


Fig. 623. Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	*C.P.*	*Steel.*	*Copper Case.*		*Gas per hour.*	*C.P.*	*Steel.*	*Copper Case.*
1-light	4 feet	125	**30/-**	**5/-** extra.	3-light	12 feet	400	**52/6**	**6/-** extra.
2-light	8 feet	260	**47/6**	**6/-** extra.	4-light	16 feet	550	**72/6**	**9/-** extra.

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3/6** per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) **3/4½** per dozen, or in case lots of 5 gross, **33/-** per gross.

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Clear Glass Globes, each	**2/3**	**5/9**	**5/9**	**9/-**
" " " In Case lots per dozen.	**19/6**	**57/9**	**57/9**	**93/-**
Case contains . .	*80*	*18*	*18*	*12*

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Wired Globes, extra each	**2/-**	**2/-**	**2/9**	**3/6**
Parabolic Reflector, extra "	**3/6**	**6/-**	**7/6**	Not made

Welsbach Mantles, each **6d.** subject as usual.

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price **4½d.** each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,

Welsbach House, 344-354, Gray's Inn Road, London, W.C.

Telegrams and Cables: "WELSBACH LONDON." *Telephone* 2410 NORTH.

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Is sent out in Skeins all ready for use.
Every Skein of equal weight and length.
The Lead Wool Joint is built up evenly all the way through.
Lead Wool requires no melting and can be used in water without risk.

Lead Wool Joints are Twice as Strong as Cast Lead Joints and cost 33⅓ per cent. less.

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THE GASHOLDERS AND OTHER OUTSIDE PLANT IT IS FALSE ECONOMY TO USE A CHEAP PAINT WHICH LOSES COLOUR AND DOES NOT PROTECT THE IRON FROM CHEMICAL FUMES.

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Prices and particulars on application.

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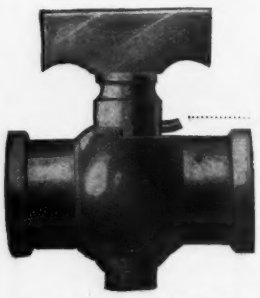

FIG. 1. The Old Style with the Old Trouble.
Note the Pin **A.**

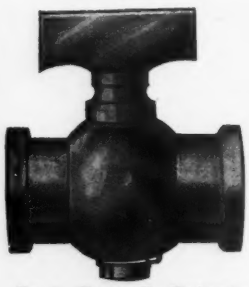

FIG. 2. **Evered's Patent "Safety Stop."** No Pin. No trouble.

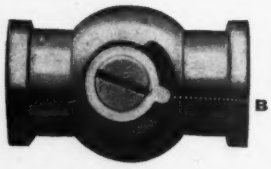

FIG. 3. Underside showing "Safety Stop" in lieu of Pin.

EVERED'S PATENT "SAFETY STOP."

Buyers of Gas Fittings are familiar with the trouble constantly arising through the Stop Pin of the Tap or Cock getting bent or broken, or falling out, thus leaving the Tap without a Stop, and leading to great danger of an escape of Gas.

EVERED'S PATENT "SAFETY STOP"

renders the old Stop Pin unnecessary and is an absolutely **Safe and Permanent Stop.**

The projection shown in Fig. 3, marked **B,** working in the recess shown in Block, allows the Tap to be turned only so far as the recess extends. There is no possibility of the Tap turning further round as there is no Pin to become displaced or broken.

Any fitting specifically so ordered will be made with the "Safety Stop."

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Surrey Works, SMETHWICK.

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GASHOLDERS & STEEL TANKS

Carburetted Water Gas Plant.

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See next Week's issue for Full Page Advertisement.

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ANY CAPACITY IN MULTIPLES
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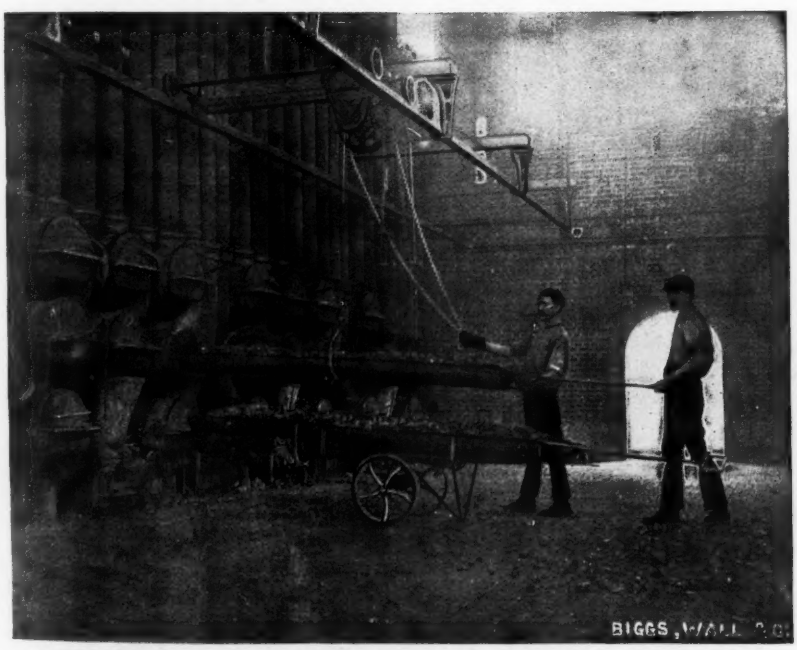

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Also for name of Works where you can see Machines in operation.

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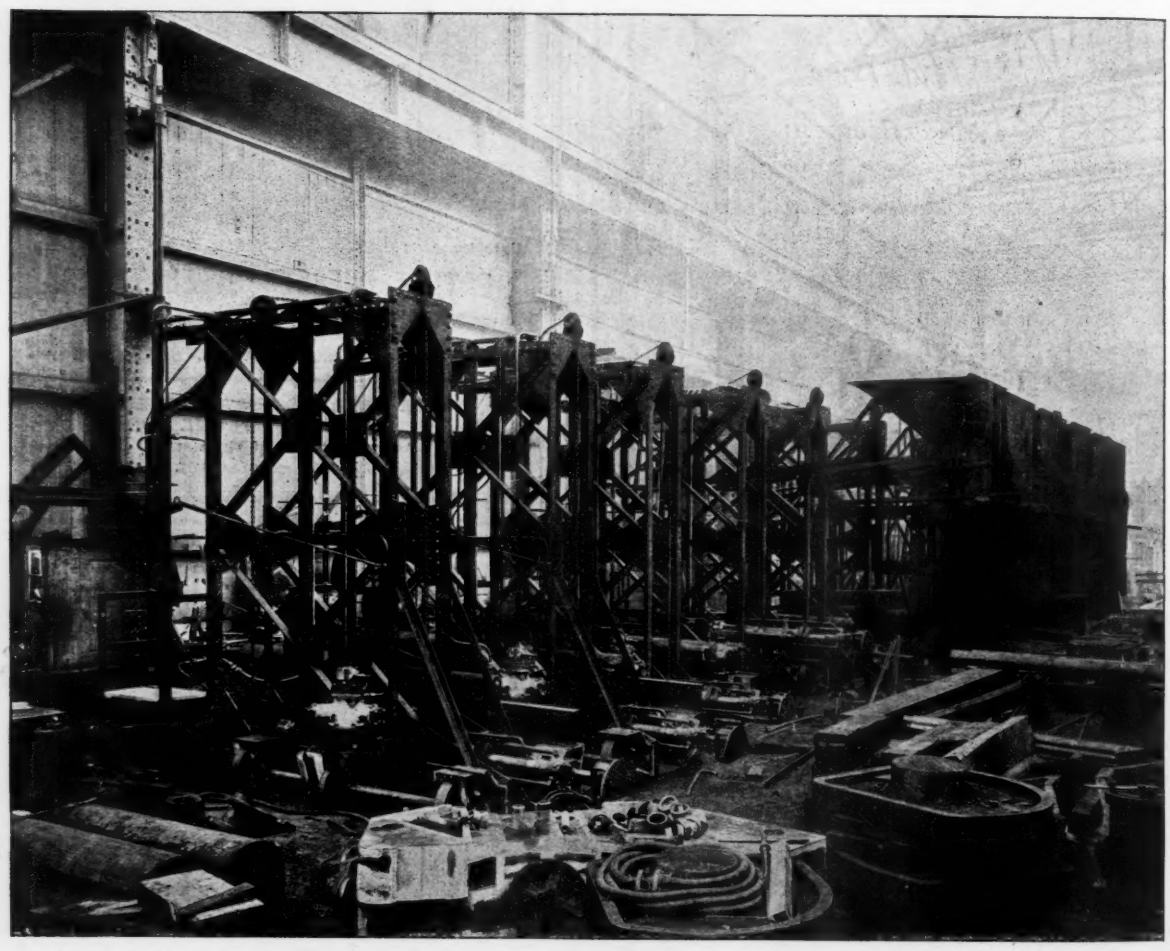
FOR

CHARGING AND DRAWING GAS-RETORTS.



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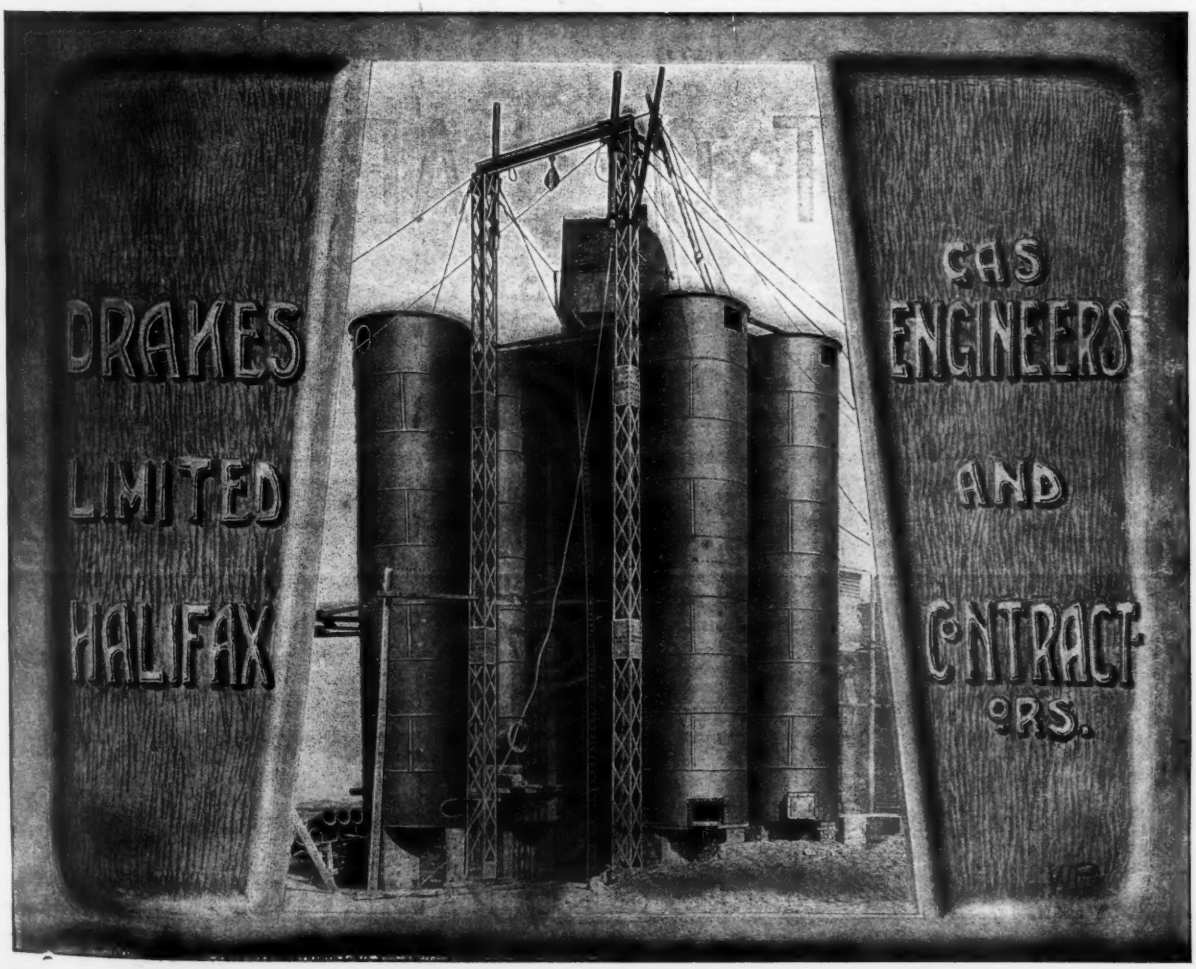

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See "JOURNAL OF GAS LIGHTING," Nov. 2, 1909.

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